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ABSTRACT

This guide to the television program 3-2-1 Contact covers 20 theme weeks. The program is designed to bring students into closer contact with the science and technology in their everyday lives. This guide includes: (1) a brief introduction to the contents of each week's shows; (2) a detailed discussion of each week's primary concepts as well as suggested activities that extend or reinforce the concepts; (3) presentations focusing on individual segments selected as particularly useful in classroom situations and suggested activities; (4) reproducible student activity pages. Topics include the tropics, light, farms, signals, oceans, motion, eating, Japan, detectives, architecture, mammals, modeling in science, the air and flying, Antarctica, human body, Australia, structures, Greece, and islands. (KR)

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CHILDREN'S TELEVISION WORKSHOP

3·2·1 CONTACT

TEACHER'S GUIDE

3•2•1 CONTACT TEACHER'S GUIDE

Publisher:
Rob Madell, Ph.D.
Vice President
Interactive Technology
& School Services

Project Director:
Cheryl A. Gotthelf
Director of School Services

Editor:
Russell Miller

Art Director:
Mike Pantuso

Science Curriculum Consultant:
Judith Geller

Contributor:
Edward G. Atkins, Ph.D.

Managing Editor:
Aura Marrero

Production Director:
Carlos Crosbie

Project Coordinator:
Beth Chayet

Cover:
Animals Animals/
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3-2-1 CONTACT is recommended by the National Education Association, the National Science Teachers Association, and the American Association for the Advancement of Science.

3•2•1 CONTACT PRODUCTION

Vice President of Production/Executive Producer:
Alfred Hyslop

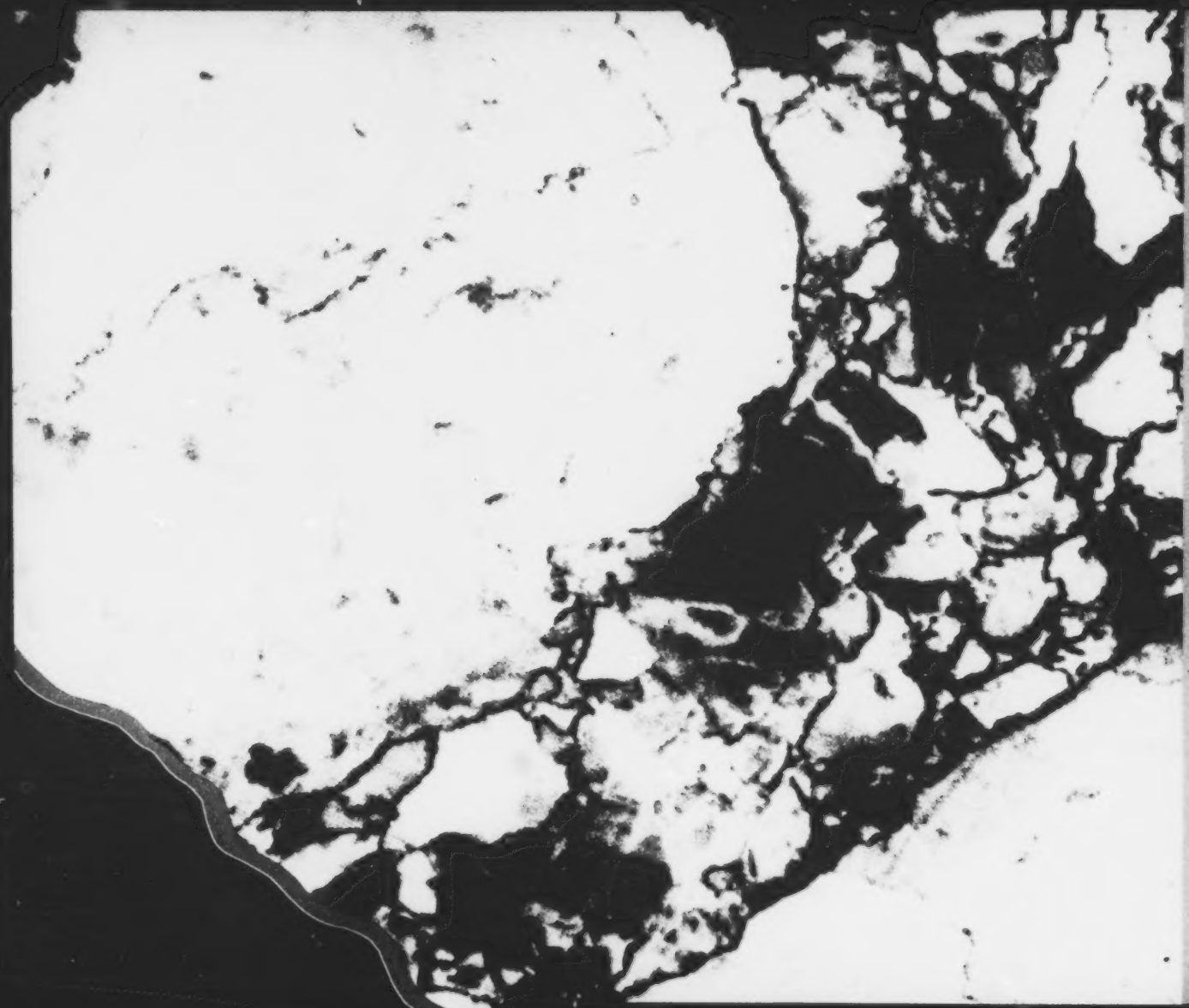
Senior Producers:
Ozzie Alfonso
Tish Rabe

Producers:
Lawrence Engel
Anne Hoffman
Susan Schwartz

Director:
Ozzie Alfonso

Director of Content:
Edward G. Atkins, Ph.D.

Associate Director of Research:
Adrienne Schure



CHILDREN'S TELEVISION WORKSHOP

3•2•1 CONTACT

TEACHER'S GUIDE

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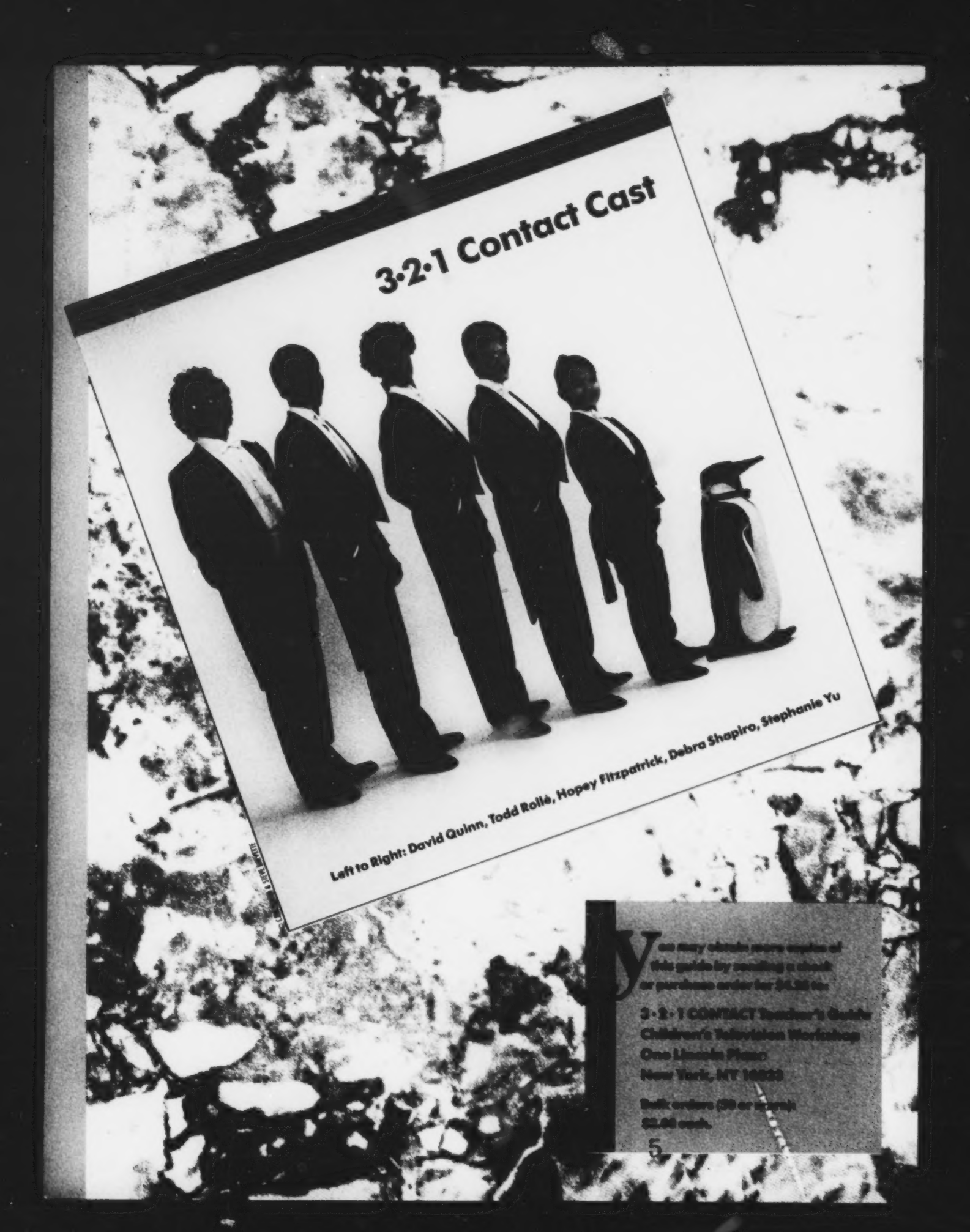

3·2·1 Contact Cast
Left to Right: David Quinn, Todd Rollé, Hopey Fitzpatrick, Debra Shapiro, Stephanie Yu

CONTENTS

Page

Introduction • 4

SEASON IV

Tropics Week (#401-405) • • • • • • • • • • • • • • • • 5
Light Week (#406-410) • • • • • • • • • • • • • • • • • 6
Farms Week (#411-415) • • • • • • • • • • • • • • • • • 8
Stuff Week (#416-420) • • • • • • • • • • • • • • • • • 9

SEASON V

Signals Week (#501-505) • • • • • • • • • • • • • • • • 10
Oceans Week (#506-510) • • • • • • • • • • • • • • • • 11
Motion Week (#511-515) • • • • • • • • • • • • • • • • 12
Eating Week (#516-520) • • • • • • • • • • • • • • • • 14

SEASON VI

Japan Week (#601-605) • • • • • • • • • • • • • • • • • 15
Detectives Week (#606-610) • • • • • • • • • • • • • • 16
Architecture Week (#611-615) • • • • • • • • • • • • • 18
Mammals Week (#616-620) • • • • • • • • • • • • • • • 19
Modeling Week (#621-625) • • • • • • • • • • • • • • • 20
In the Air Week (#626-630) • • • • • • • • • • • • • • • 22

SEASON VII

Antarctica Week (#701-705) • • • • • • • • • • • • • • 24
Your Body Week (#706-710) • • • • • • • • • • • • • • 26
Australia Week (#711-715) • • • • • • • • • • • • • • • 28
Structures Week (#716-720) • • • • • • • • • • • • • • 30
Greece Week (#721-725) • • • • • • • • • • • • • • • • 31
Island Week (#726-730) • • • • • • • • • • • • • • • • 32

INTRODUCTION

Using This Guide

The 3-2-1 CONTACT Teacher's Guide covers 20 distinct theme weeks, as listed in the table of contents. You'll find:

- a brief introduction to the contents of each week's shows.
- detailed discussion of each week's primary concepts. These discussions point out specific segments that build toward the concept. They also suggest activities to extend or reinforce the concept.
- presentations focusing on individual segments selected as particularly useful in classroom situations. These presentations also include activity suggestions.

For several theme weeks, you'll also find reproducible student activity pages. Instructions for the activity appear just to the left, on the facing page. Feel free to reproduce these activity pages or any other material in the Guide for your own in-school use. (Any further reproduction is prohibited.)

Whenever possible, try out the suggested activities ahead of class. You may decide to make minor adjustments—turning a small-group activity into a pairs activity, turning a full-class project into a two-team competition, substituting a material that's easier for you to obtain, and so forth.

Space doesn't permit detailed discussion of every segment in the 100 shows covered by this Guide. But every segment is briefly described in the program listing you'll find in the middle of the book. Segments listed there, but not in the body of the Guide, may be appropriate for your particular needs. The listing includes a correlated curriculum, associating 3-2-1 CONTACT segments with standard elementary school science topics.

3-2-1 CONTACT brings the excitement of science into your classroom. With mini-documentaries, music videos, and animations, with visits to men and women working at the frontiers of science all over the world, 3-2-1 CONTACT gives students access to science experiences that might otherwise be impossibly remote. And this Guide gives you access to 3-2-1 CONTACT.

Each week of 3-2-1 CONTACT provides structured exposure to a different domain of science. Within each of these "theme weeks," each program develops one aspect of the overall theme, presenting an assortment of short segments designed to arouse interest, elucidate, and motivate.

The key to effective classroom use of 3-2-1 CONTACT is identifying appropriate material from the series—whether short segments, full half-hour shows, or entire theme weeks. This Guide is designed to help you find the material you need.

Using 3-2-1 CONTACT

Your local public television station can provide you with a current 3-2-1 CONTACT broadcast schedule.

- Feel free to tape 3-2-1 CONTACT for classroom use. It's perfectly legal. 3-2-1 CONTACT may be taped off the air for in-school classroom use, provided that the tape is erased within three years.

Whenever possible, screen segments before using them in class. You may well find applications this Guide doesn't cover.

3-2-1 CONTACT is closed captioned for hearing-impaired students.

PHOTOS © CTW

TROPICS

Episodes 401–405 • A science-minded [illegible] to tropical Malaysia, where rubber grows in trees...where tin comes out of the ground...where monkeys collect [illegible] for fishermen, and tame elephants are trained to live in the wild! 3-2-1 CONTACT's cast uncovers an amazing array of technology and traditions.

Mining and Refining

By processing and refining, people turn raw materials into materials we can use. Malaysian rubber workers tap trees for latex, then turn the liquid into usable rubber (Monday). Tin miners break up gravel banks with water, then filter ore out of the mud (Tuesday).

Are any raw materials collected in your town? Do any nearby plants process raw material—from metals to milk? Kids can research local industries. Better yet, take a field trip to a nearby factory.

Training Wild Animals

Each animal species has characteristic behaviors. In Malaysia, people train wild animals to apply their abilities to meet human needs. Water buffalo are trained to plow flooded rice fields (Wednesday). Monkeys use their tree-climbing talents to harvest coconuts, and elephants pull heavy logs through the deep jungle (Thursday).

Trainers depend on repetition to teach animals new tricks. That's one way people learn, too, as kids can discover. Make up a list of five or ten unfamiliar sets of letters (e.g., mkp, zdt, fyg). Have kids study the list for 30 seconds, then write down as many as they recall. Repeat the procedure over and over, recording scores, until most kids approach 100% accuracy. Discuss how repetition helps you learn.

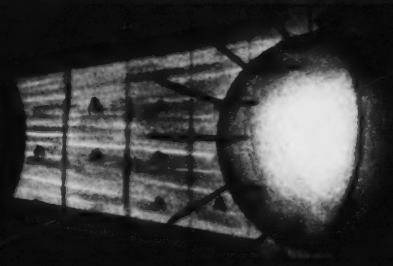
The next day, surprise the class by repeating the experiment—with the same sets of letters. They'll see how relearning—a form of repetition—is easier than learning something for the first time.

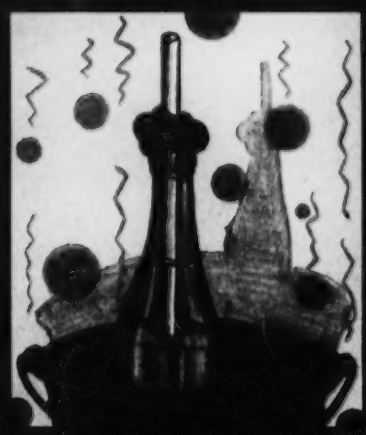
PACO'S TRAVEL BUREAU

Young Paco, set for sun and fun in his flowered shirt and sunglasses, uses zany props to reinforce learning in this special feature sprinkled throughout Tropics Week.

The tropical zone is the place where sunlight meets the Earth at nearly a 90-degree angle all year round. Because sunlight pours straight down, shadows are short in the tropics. North and south of the tropics, shadows lengthen.

[illegible] Paco, your students can find the tropics on a globe. Then, with a large cylindrical [illegible], a flashlight, and toothpicks, they can [illegible] the tropics' special, geographically specific





Bouncing, Breaking, Bending

A massive telescope in the Arizona desert bounces light off giant curved mirrors, creating images of the Sun (Monday, Friday). Prisms break white light into its colorful components. A California artist uses these to create a "sun painting" (Tuesday). An old lighthouse on the California coast bends light through precision lenses, flashing a message in a focused beam to ships at sea (Friday).

Like a lighthouse, kids can send messages with light. A flashlight is the light source. A small, fresh, flat piece of aluminum foil makes a reflector. By holding the foil at an acute angle to the beam of light, you can bounce the light across a dimly lit room. Tilt the foil back and forth to flash Morse code "dots" and "dashes."

Visual Information

All eyes are on Light Week. Monday, an animation shows how the human eye works, then an animal physiologist explains why animals living in different habitats need different kinds of eyes. Wednesday, a scientist dissects a cow's eye. (Note: This segment is especially graphic.) Thursday, cast member Mary goes for an eye exam, then CONTACT presents an intriguing view of the world through animal eyes.

A simple experiment shows how eyes adjust to brighter or dimmer light. Have kids sit in pairs, facing each other watching each other's eyes. Turn the room lights off, then on. Kids can record their observations and try to explain them. (When the light goes on, the iris, or colored part of the eye, closes down protectively, allowing very little light into the pupil, or dark hole in the middle of the eye. After a moment, the iris opens slightly, adjusting the pupil to the actual intensity of the new light.)

MORSE CODE

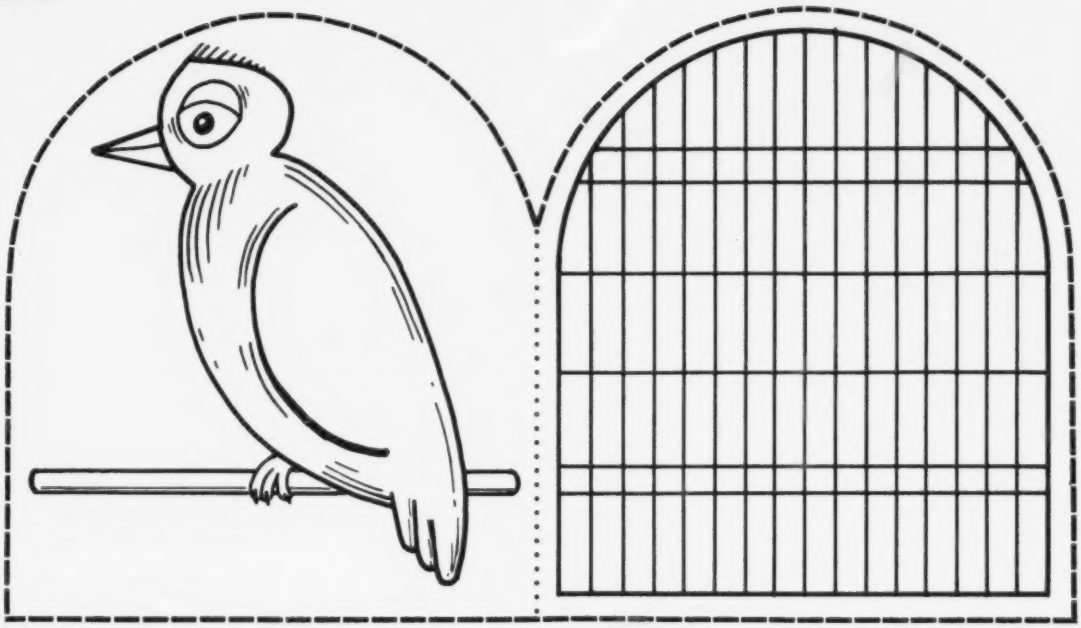
A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	1	2		
3	4	5	6	7	8	9			
0	Period	Comma	?	Colon					
Semicolon	Hyphen	Slash	Quotes						

The Bird Cage

NAME _____

DATE _____

CONTACT



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Homemade Movies

NAME _____

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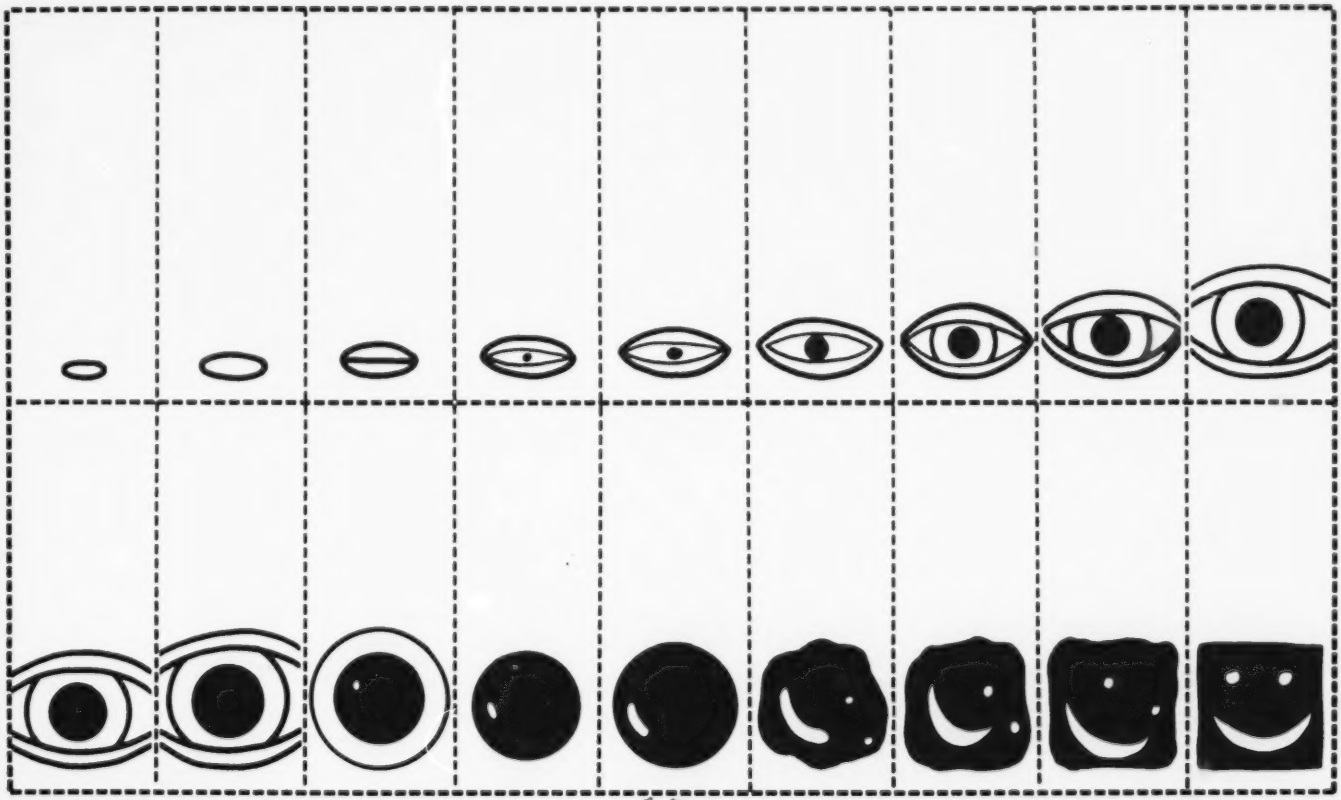

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FARMS

SHOWS 411-415 • Farms aren't natural. They're places where people go beyond nature—developing new ways to breed, feed, and care for plants and animals. Farms Week takes 3-2-1 CONTACT viewers behind the scenes for a look at the science of modern agriculture.

Breeding Plants and Animals

Sheep raisers want sheep with thick wool and no horns (Monday). Cattle ranchers want cattle as hardy as a Brahman, with the good beef of an Angus (Wednesday). So they breed selectively, mating pairs of animals with desirable traits to create a desirable hybrid. (The concept of hybrid animals is reinforced on Wednesday as Paco and Miguel take their newfound mutt on a visit to a veterinarian.)

Selective breeding works in plant culture as well (Tuesday). Diego learns how to graft a citrus branch to a disease-resistant root stock, a basic step in improving fruit production. Then Anitha visits a lab where researchers use bud grafts to develop more productive, faster growing, longer living rubber trees.

Each cell of a plant contains genes —growth information—from its parents. A grafted branch or bud contains different genes—and different growth characteristics—from the plant to which it's grafted. Because genes aren't just in seeds, many plants can be grown from parts other than seeds:

- ▶ Grow a coleus from a branch. Leave the branch in water until it grows roots, then transplant to soil.
- ▶ Grow jade plants, African violets, or succulents from leaves. Cut a few nicks in a leaf, and place it on moist soil. It will root and grow.
- ▶ Grow a potato plant from the eye of a potato. Cut out a piece of potato including an eye, plant it in soil, and water regularly.
- ▶ NOTE: Plants may take weeks or months to grow from parts other than seeds. Keep them moist, and be patient.

Varied Products

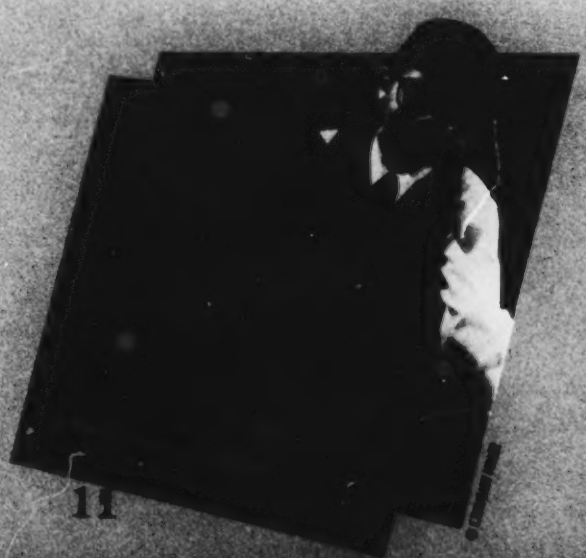
From the birth of a calf (Wednesday) to the milking of a dairy herd (Thursday), Farms Week explores the farm origins of products we use every day. The music video "Shoes and Rouge" (Thursday) presents a fast-moving montage of leather goods, plastics, medicines, cleaning items, and sundries that come from a cow. Friday's visit to a chicken farm traces a chicken's path from birth to market, all in strictly controlled environments. (Some viewers may be disturbed by the methods employed to produce 25,000 chickens a day.)

Many kids don't know where the things they use every day come from. Have your class trace the origins of a typical bag of groceries. What kind of farms or factories produced the items? In what country? Kids can find much information right on a packaged product's label. They can research some products in the library and ask about others at food stores. For more information, they may want to contact manufacturers. (Look for an address or a toll-free phone number on the package.)

PIGNEWS

Are pigs stupid? Why do they wallow in mud? Can they swim? What's a feed-to-meat ratio? How loud can pigs squeal? These questions and more are answered on Pignews, a special feature (every day but Wednesday) of Farms Week.

Cast members Paco and Mary wear rubber hog snouts for a pleasantly piggy parody of TV newscasts. Use the same method to put a new spin on classroom oral reports. Have kids choose, research, and report on a farm animal. They can make their own masks to wear during their newscasts. If video equipment is available, tape the proceedings and play them back for a real TV feel.



STUFF

SHOWS 416-420 • Everything we make is made of stuff—basic materials like metals, clay, glass, feathers, and rubber. Each has its own properties. How we heat them, beat them, bend them, and shape them into the products we need—that's the stuff of Stuff Week.

CONTACT—It's a Fact

This week is, well, stuffed with intriguing science facts—the kind kids love to memorize and share. Paco and Miguel present several in "CONTACT—It's a Fact" (Monday):

- **The Statue of Liberty weighs 450,000 pounds.**
- **You can roll gold thin enough to paint with.**
- **Our bodies contain metal.**
- **A strand of spider web is stronger than a steel strand of the same size.**

Distinguishing Properties

Hard. Soft. Stiff. Pliable. Resilient. Delicate. Every material has specific properties that make it appropriate for particular uses. During the restoration of the Statue of Liberty, the CONTACT crew dropped by to see how craftspeople choose specific materials for specific purposes (Monday). Miguel learned that strong, flexible latex is perfect for mask-making, as a make-up expert used the stuff to turn him into a wolf-man (Thursday). Talking with aeronautic engineers, Miguel found out about innovative plastics light and tough enough to use in a human-powered airplane (Friday).

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Kids can explore materials' properties by trying to make similar objects out of different stuff: clay, rubber bands, paper clips, paper, plastic wrap, popsicle sticks, and cloth. Using only one material at a time, they can try to make:

—a container that will hold water for one minute

—a bridge with a three-inch span

—a ball that bounces.

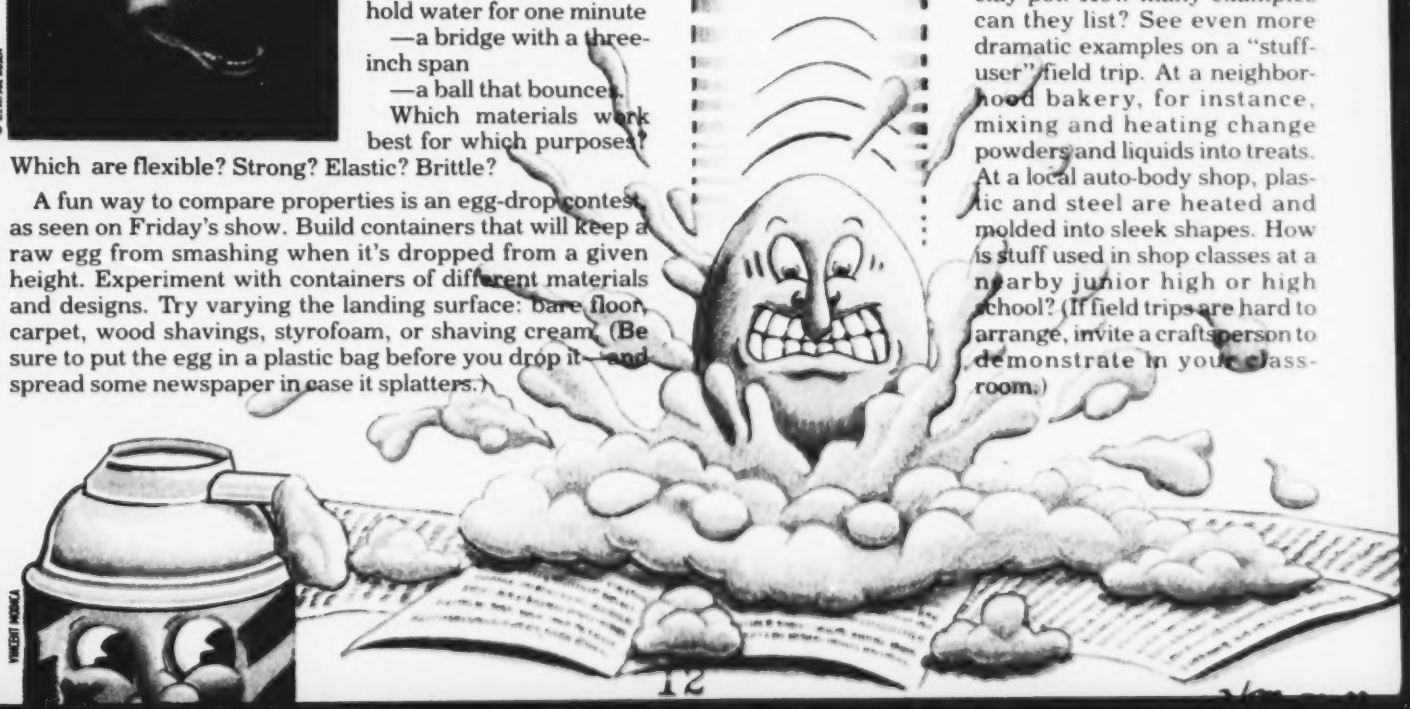
Which materials work best for which purposes? Which are flexible? Strong? Elastic? Brittle?

A fun way to compare properties is an egg-drop contest, as seen on Friday's show. Build containers that will keep a raw egg from smashing when it's dropped from a given height. Experiment with containers of different materials and designs. Try varying the landing surface: bare floor, carpet, wood shavings, styrofoam, or shaving cream. (Be sure to put the egg in a plastic bag before you drop it—and spread some newspaper in case it splatters.)

Properties Can Change

An artisan heats copper, making it pliable enough to shape into new skin for the Statue of Liberty (Monday). A potter bakes clay to make strong, waterproof ceramic (Tuesday). One craftsman heats steel to soften it, and another melts glass into liquid. Each changes a material's properties in order to create a new form (Wednesday).

Every day, kids see how properties are changed—from hard-boiling an egg to firing a clay pot. How many examples can they list? See even more dramatic examples on a "stuff-user" field trip. At a neighborhood bakery, for instance, mixing and heating change powders and liquids into treats. At a local auto-body shop, plastic and steel are heated and molded into sleek shapes. How is stuff used in shop classes at a nearby junior high or high school? (If field trips are hard to arrange, invite a craftsperson to demonstrate in your classroom.)



SIGNALS

SHOWS 501-505 • Whether sounds, gestures, written symbols, or electronic impulses, signals carry information from one animal to another. From secret codes to synthesizers, from Native American sign language to rooms that "understand" speech, Signals Week gets the message across.

Transmitting Information

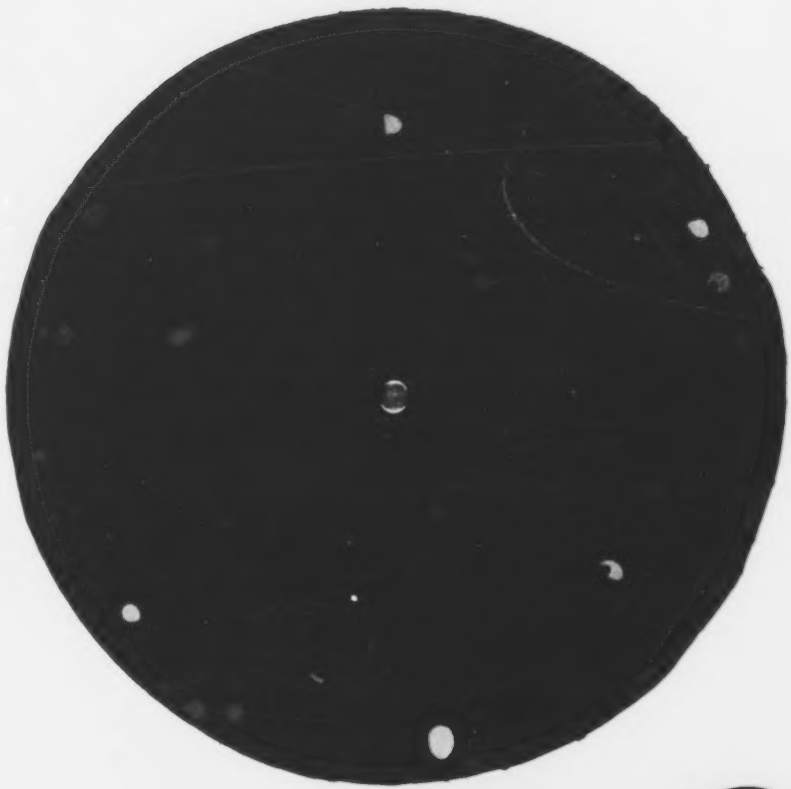
To communicate with signals, everyone in a group has to agree on what the symbols mean. Shepherds in the French Pyrenees agreed long ago on the meanings of a set of whistling sounds. They use the whistles to "talk" over great distances (Monday). Three Native American tribes speak different languages, but agree on the meanings of hand signs (Monday). Trainers teach animals to respond to specific, "agreed-upon" gestures (Wednesday).

A fun way to experience the importance of agreeing on signals is to use unconventional ones. Students can invent a new set of names for common objects. Can outsiders listening in on their conversation learn the "language"? (See "Diner Lingo," below.)

Kids can experiment with nonverbal communication, too, by using pantomime to communicate the meanings of pre-chosen phrases.

Translating Information

Information can be translated from one set of signals to another. Chantal visits a "voice-activated room" that translates spoken commands into electronic signals. The signals control machines that open and close a door and operate a television set (Tuesday). A newspaper's computers translate words and pictures into signals that carry information between distant reporters, editorial offices, and printing plants (Thursday). Two-hundred-year-old towers in France look something like windmills, but they're actually used to transmit information between distant cities (Friday).



All these systems are codes. Kids can create their own codes, using a code wheel. Cut a large and a small circle out of cardboard. Write the alphabet and the ten digits around the edge of each circle (see above). Fasten the two circles together at the center. Each time you turn one of the circles, you create a new letter-to-letter correspondence—a new code.

Codes can be spoken, too. Pig Latin is a spoken code. You decode it with your ears. Here are the rules: If a word begins with a consonant (or consonant blend), move the consonant to the end of the syllable and add "ay." If the word begins with a vowel, just add "ay." "Boiled egg" becomes "oiled-bay egg-ay." Kids can make up their own spoken codes, choosing sounds to add uniformly to words or syllables.

Small groups often develop private sets of signals for their own special needs. In a diner, "two on a raft, wreck 'em" means "scrambled eggs on toast." On Monday, the CONTACT crew learns some diner lingo from a friendly waitress. Your kids can, too:

- **cow juice = milk**
- **whiskey down = rye toast**
- **bowl of bird seed, drowned = dry cereal with milk**
- **radio through the garden, wheat on = tuna salad sandwich**
- **boiled leaves = tea**
- **gobble up the river = turkey soup**
- **CJ white = cream cheese and jelly sandwich on white bread**
- **one dog, walk it = hot dog**
- **Adam and Eve with a lid on = apple pie**

Ocean Physics

The physical properties of a body of water as vast as the ocean can be surprising. For instance, waves seem to transport water from far at sea into shore. In fact, they don't. They churn water up and down, but leave it mostly in its original location (Monday).

Another principle of ocean physics enables submarines and scuba divers to visit ocean depths and return safely to the surface. It's buoyancy. The water beneath an object pushes up on the object. If an object is less dense than water, it will float up. If it's denser than water, it will sink (Tuesday).

Students can experience buoyancy in a simple experiment. Tie two feet of twine to a heavy [illegible] as a brick or a large pl[illegible] of water. Raise it [illegible] ground, then lower it. [illegible] two feet into a pail [illegible] move downward more slowly [illegible] the water is supporting it from [illegible]

Another experiment shows how density affects buoyancy. Place an egg in a bowl of water. It will sink because the egg is denser than the water. Mix salt into the water—as much salt as you can manage to dissolve. This increases the density of the water. Place the egg in the salt water. The egg is now less dense than the water, so it will float.

Ocean Biology

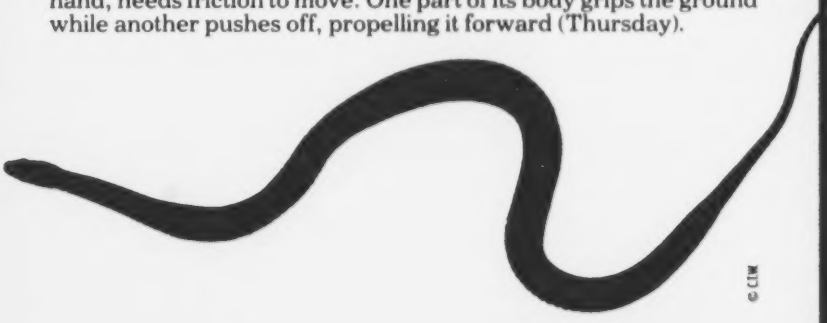
The ocean is full of unusual [illegible] and plants—from whales to [illegible]

Motion

SHOWS 511-515 • Gymnasts, stage fights, bike-riding skeletons, and slapstick silent movies all help illustrate this week's basic notion: Motion depends on the interplay of physical forces. People apply physics to make the most of motion, inventing machines that make given forces do more work.

Forces Cause Motion

Muscle power sends a gymnast upward. Gravity pulls her down (Monday). Friction slows motion, so high-speed ice-boats and trains are designed to minimize friction. A snake, on the other hand, needs friction to move. One part of its body grips the ground while another pushes off, propelling it forward (Thursday).



A bottle cap and an eraser can teach kids about friction. Make a ramp by taping one end of a piece of stiff cardboard to a table top and raising the other end. (If you like, pile thin books under the cardboard as a wedge to hold the ramp up.) Place the bottle cap and the eraser at the top of the ramp. Increase the angle of the ramp. Which object slides down first?

One object slides down before the other because they're made of different materials. Different materials have different amounts of friction. Try the experiment with other small objects, such as paper clips, coins, and small, flat stones. Try taping rough materials to the ramp (e.g., cotton gauze, corduroy, different grades of sandpaper). They'll change the surface texture and increase the friction. What happens?

Mechanical Advantage

Simple machines have big effects. Pulleys can help a 54-pound girl lift a 150-pound boy, or a two-ton force lift 25 tons of solid marble (Monday). Levers can reduce the amount of force needed to move a heavy object—although the distance the object moves is reduced, too (Friday). The increase in effective force is called mechanical advantage.

It's fun to experiment with simple machines. A ruler and a very small block can act as lever and fulcrum. By experimenting with different weights on the two ends of the ruler, students can discover the relationship between weight and distance from the fulcrum. (Distance times weight on one side of the lever equals distance times weight on the other side.) They can do similar experiments on a larger scale with a playground seesaw—a common lever.

The Coefficient of Restitution Show

NAME _____

DATE _____

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SHOWS 516-520 • Eating is fun. Eating is good for you. And eating is scientific. Different animals need different foods, and their bodies are designed to make the most of the foods they eat. Eating Week looks at food and digestion from taste to waste.

Picky Eaters

Koalas don't eat chicken à la king, and humans don't munch eucalyptus. Wild lesser pandas steal eggs for protein and chew bamboo to help their digestion. Fleas that thrive on rabbit blood detest the blood of owls. Tuesday's and Wednesday's programs look at the eating habits of various animals, with special emphasis on the categories of herbivore, carnivore, and omnivore.

What do kids eat? Students can keep a week's food diary, then chart what they ate by food group—meats, vegetables, cereals, and dairy (or by another set of categories, such as proteins, carbohydrates, fats, vitamins, minerals, and water). Are they eating what they should? Your school nutritionist or local health department can provide information on nutrition for humans. Have kids research eating habits in other parts of the world. Is there one best human diet? How do people's needs differ from those of their pets? Call a local vet for dog and cat nutrition information.

The Big Breakdown

Digestion—the breakdown of food into usable nutrients—begins with teeth (Monday). Some cut. Some tear. Some crush and crack. Some grind and chew. Cast members David Quinn and David Drach go for a dental check-up and learn what teeth are made of. (The next-to-last segment graphically depicts the drilling and filling of David Quinn's cavity.)

Kids can feel the way different teeth do different jobs—right in their own mouths. Take a crunchy food item, such as a carrot, a celery stalk or a cracker. Pay careful attention as you bite a piece off, chew it, then swallow it. Almost automatically, food passes from the tearing teeth in the front of the mouth to the grinding teeth in the back before it's ground fine enough to swallow.

Past the teeth, food enters the gastro-intestinal tract (see Paco's Kitchen). There, chemicals called enzymes help break down food to usable form. Some people's bodies don't produce certain enzymes, so they can't eat certain foods. For example, without the enzymes to break down milk sugar, a person can't drink milk (Thursday).

It's hard for students to test the enzymes in their own bodies, but they can experiment with a similar enzyme found in fresh pineapple. Make up three batches of gelatin dessert: one plain, one with any fruit but fresh pineapple, and one with fresh pineapple. The gelatin with pineapple won't gel, because an enzyme in fresh pineapple breaks down the gelling protein. (That enzyme isn't in canned pineapple. It's destroyed by heat in the canning process.)

The concept of digestion is summarized with the dissection of a pig's digestive tract (Thursday). This segment clearly and graphically shows the process and products of digestion.

JAPA

1-605 • In Japan, age-old crafts and -art technologies not only exist side enrich each other. Earthquake rn design principles by studying n temples. Judo masters run com- s to improve their performance. ure and contemporary science ONTACT visits Japan.

Defense Against Disaster

Geography and climate pose particular problems in Japan. Mt. Fuji, the national landmark, has been eroding for 1,000 years. Now civil engineers are working on a project to control Mt. Fuji's mudslides and to catch falling boulders before they endanger towns at the mountain's base (Tuesday).

Soil erosion is another problem in Japan. So researchers create artificial rainstorms to study the effect of heavy rain on common soil types (Tuesday).

Students can experiment with erosion by building a model hill of soil, sand, moss, clay, and pebbles in the corner of a large aluminum pan. Sprinkle water on the hill with a watering can. Note how mud forms and runs off. Plant cardboard "trees" in the hill to help reduce erosion. How do trees help? Which helps more —a few large, strong trees or many smaller trees? What other factors (wind, intensity of rainfall, a covering of dead leaves) affect erosion?

Technology Old and New

Throughout Japanese society, modern technology is applied to traditional practices. A scientist uses principles of aerodynamics to improve on a traditional kite design (Wednesday). A computer learns to recognize Kanji, one of several systems used for writing the Japanese language (Friday).

Many older technologies continue without change. Pearl farmers have been using the same method of culturing pearls for a century (Monday). School children still learn to write Kanji characters stroke by careful brush stroke (Friday). And paper makers continue to use a method that's hundreds of years old (see "Paper Making" at right).

Japanese school children discuss their views of science and its role in society on Tuesday, Thursday, and Friday. Extend the discussion into your classroom. How can science help the world as students see it? What worries them?

PAPER MAKING

On Wednesday's program, cast members David Quinn and Kaori Tomita learn a centuries-old method of making paper by hand. Make paper in your classroom by recycling old newspapers, paper towels, or manila drawing paper.

1. Tear a few sheets into small bits and soak in water for 24 hours.

2. Beat the wet paper to a smooth pulp with an egg beater. (Experiment if you like, adding fine bits of thread, grass, plastic wrap, etc. to strengthen the final product.)

3. Dissolve four tablespoons of laundry starch in cold water and stir into the pulp. (Again, students can experiment, using more or less starch.)

4. To form a sheet of paper, take a small piece of window screening and dip it into the pulp mix, coating it with a thick, even layer.

5. Place the screen on a tray lined with absorbent paper. Cover with a small piece of Plexiglas (or glass). Put books on top as weights.

6. Leave to dry overnight in a warm place, then carefully peel the dried paper off the screen.

Describe the paper. Is it thin or thick? Can you write on it with pencil? Pen? Marker? Can you tear it? Cut it with scissors? To test its absorbency, dip one corner in a teaspoon of colored water. How much water does it absorb? How long does it take? Compare the paper to commercially produced paper. What different purposes might different types of paper serve?

DETECTIVES

SHOWS 606-610 • The world holds many mysteries. Like private eyes, scientists search for clues, piece them together, and try to come up with explanations. This week, science detectives tackle mysteries from the sex of an Egyptian mummy to the eating habits of urban America.

Recognizing Clues

Science detectives are trained to find clues others might ignore. A British archeologist determines that a pair of deer antlers was once a set of digging tools (Monday). An archeologist in Kenya digs up stones which were used as cutting tools 7,000 years ago (Tuesday). A biologist in Idaho points out evidence of unseen owls (Wednesday).

How do you know what clues to look for? Take a set of 10 or 20 objects. For each, come up with five questions whose answers help to identify the object. Are there general-purpose questions that help any detective identify any object?

Once you know what clues to look for, how do you find them? Through careful observation. Hide a set of objects—buttons, paper clips, pencils, and so forth—around the classroom. (Any very common object should be plainly marked as the one that was hidden.) Give students a list of the hidden objects. When they find one, they should note its location, but leave it in place for others to find. What makes some objects harder to find? Color? Size? Shape? Lack of contrast with surroundings?

Knowns and Unknowns

On Friday's program, detectives identify fingerprints found at the scene of a crime by checking them against known prints. Kids can do the same:

• Before the lesson, have two or three students leave fingerprints by gripping a clean, shiny, smooth object, such as a steel index-card box.

• Create a student fingerprint record.

1. Distribute copies of the Fingerprint Record Card you'll find on the reproducible page.

2. Have students wash their fingertips carefully and allow them to air-dry. (Paper towels can leave lint behind.)

3. Use a stamp pad to ink one fingertip at a time. Gently roll the fingertip from left to right in the appropriate space on the card.

4. Wash off the ink with soap and water.

• "Lifting" the fingerprints.

1. Use an emery board to scrape a small pile of graphite dust from a pencil.

2. Sprinkle the dust on the prepared shiny object.

3. Blow lightly to dislodge extra dust, then cover each print with cellophane tape.

4. When you remove the tape, the print should come along. Affix the tape to a white index card to preserve it.

5. Compare the "lifted" prints to the prints recorded on classmates' (and teachers') Fingerprint Record Cards. Who were the culprits?

What Does Your Garbage Say?

That's the question asked in Tuesday's music video. The preceding segment, "The Garbage Project," shows how to get an answer. Learn what your school's trash says by running your own "trash project."

1. Collect trash from several classrooms, several days in a row. (Wear rubber gloves.)

2. Label each bag, indicating classroom and date, in case you can't examine it the same day.

3. Record each bag's weight, date, and classroom of origin. Sort contents onto trays or into bins (e.g., notebook paper, food wrappings, ditto masters, broken pens).

4. Record type and amount of each kind of trash on a copy of the Trash Record Card on the reproducible page.

5. Throw the trash away.

To interpret the data, consider kinds and quantities. Did they differ day to day, or class to class? Can you identify a class's favorite activities? Can you tell when special events took place (e.g., a test, a party, a class taught by a substitute teacher)? What can trash tell a scientist?

CHILDREN'S TELEVISION WORKSHOP

3 • 2 • 1 CONTACT

TEACHER'S GUIDE

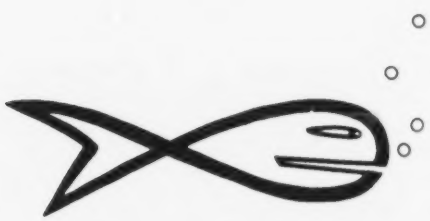
PROGRAM LISTING

On the next 15 pages, you'll find a listing of all the content segments in the 100 shows of 3-2-1 CONTACT, seasons IV-VII. (We've omitted brief introductory and connecting segments.)

You can use this program listing to locate segments that fit with lessons you're planning. At the front, you'll find an outline of topics generally covered in elementary-school science classes. To find the concepts associated with each segment, note the coded references following the segment's description.

If you're using video cassettes, it's helpful to preview the material before you show it to your students. Use this listing as a guide.

You can also use this listing to get a sense of a whole show's contents before it's broadcast. (Your local PBS station can provide you with broadcast dates.) Each show can be identified by title and number, as noted here. You'll see the number in the lower left corner of your TV screen at the very beginning of the program.



SCIENCE TOPICS OUTLINE

A. LIFE SCIENCE

1. Animals
- a. Classification
- b. Adaptation and Behavior

2. Plants
- a. Classification
- b. Adaptation and Behavior

3. Ecology and Conservation

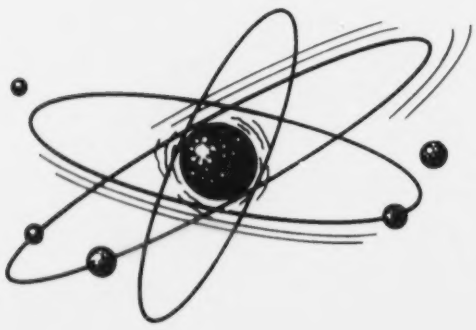
4. The Human Body
- a. Systems of the Body
- b. Health or Wellness

B. PHYSICAL SCIENCE

1. Matter
- a. Properties of Matter (mass, volume, density, hardness, ductility)
- b. States of Matter (solid, liquid, gas)
- c. Changes in Matter (chemical reactions, conservation, combination)
- d. Structure of Matter (atoms, elements, molecules, compounds)

2. Energy
- a. Types of Energy–Light
- b. Conservation of Energy

3. Forces, Motion, Work
- a. Position and Motion
- b. Forces
- c. Work and Machines



C. EARTH SCIENCE

1. Earth
- a. Changes in the Earth
- b. Exploring the Earth
- c. Earth Materials (water, metals)
- d. Mapping and Navigation

2. Weather, Climate, Seasons

3. Space (the solar system)

4. Oceans

D. COMMUNICATIONS

1. Verbal and Nonverbal

2. Electronic, Computers

E. CAREERS

F. SKILLS IN SCIENCE

1. Measurement

2. Observation

3. Process
- a. Scientific Method
- b. How Things Are Made

SEASON IV

Length	Title and Description	Science Topics

TROPICS WEEK

Monday (#401): Rubber

2:00	**Tropics**—a visual introduction	C2
1:00	**Paco's Travel Bureau**—what is rubber?	B1a
9:00	**Rubber Trees**—how they're tapped for latex (Part I)	A2a,A2b,B1c,F3b
2:00	**Malaysia**—where is it? what is it?	C1b
13:00	**Rubber Trees**—liquid latex becomes solid rubber (Part II)	A2a,A2b,B1c,F3b
1:00	**Paco's Travel Bureau**—rubber recap	

Tuesday (#402): Metals

2:00	**Tropics**—a visual introduction	C2
:30	**Paco's Travel Bureau**—what is tin?	B1a
10:00	**Visit To A Tin Mine**—mining and refining with water	B1a,C1b,C1c
1:00	**Paco's Travel Bureau**—a ceremonial sword or "keris"	B1a
13:00	**Forging A Keris**—heat-treating steel alloys	B1a
1:00	**Malaysia**—where is it? what is it?	C1b

Wednesday (#403): Rice

2:00	**Tropics**—a visual introduction	C2
12:00	**Raising Rice In A Padi**—grain grows in deep water	A2b,F3b
2:00	**Malaysia**—where is it? what is it?	C1b
10:00	**Padi Harvest**—separating grain from chaff	A2a,A2b,F3b
2:00	**Paco's Travel Bureau**—amazing facts about rice	A2

Thursday (#404): Monkeys And Elephants

2:00	**Tropics**—a visual introduction	C2
13:00	**Monkeys Help Fishermen**—they collect bait from trees	A1b
2:00	**Malaysia**—where is it? what is it?	C1b
9:00	**Elephants Help Lumberjacks**—hauling heavy logs	A1b
2:00	**Paco's Travel Bureau**—what's a domesticated animal?	A1b

Friday (#405): Endangered Animals

2:00	**Tropics**—a visual introduction	C2
11:00	**The Orangutan's Return**—to the wild (Part I)	A1a,A1b,A3
2:00	**Endangered**—music video/ endangered species	A3
2:00	**Malaysia**—where is it? what is it?	C1b

Length	Title and Description	Science Topics
8:00	**The Orangutan's Return**—training a tame orang to live in the wild (Part II)	A1a,A1b,A3
2:00	**Paco's Travel Bureau**—what and why is an endangered species?	A3

LIGHT WEEK

Monday (#406): Light From The Sun

8:00	**The Sun**—through a giant telescope	C2,C3b
2:00	**See The Light**—music video	B2b
1:00	**The Eye**—how it works	A4a
12:00	**Animal Eyes**—different abilities for different needs	A4a,A1b,F2
1:00	**Jeepers Creepers**—music video/ various animal eyes	B2b,A1b
4:00	**Bloodhound Gang**—Case of the Missing Memory (Part I)	

Tuesday (#407): Color

4:00	**Leaves**—how autumn colors come to be (Part I)	A2b,B2a,F2
2:00	**Light**—music video	B2b
6:00	**Leaves**—studying their pigments in the lab (Part II)	A2b,B2a,F2
1:00	**Did You Know?**—fun facts about light	B2b
8:00	**Sun Painting**—prisms break sunlight into colored light	B2d
2:00	**Making A Sun Painting**—with a slide projector	B2d
5:00	**Bloodhound Gang**—Case of the Missing Memory (Part II)	

Wednesday (#408): Eyes

7:00	**Visual Perception**—persistence of vision and other tricks	A4a
2:00	**Light**—music video	B2b
1:00	**The Eye**—how it works	A4a
7:00	**Cow's Eye**—a dissection	A4a,F2
1:00	**Jeepers Creepers**—music video/ various animal eyes	B2b,A1b
4:00	**Darlene Librero**—a science educator tells her story	E
6:00	**Bloodhound Gang**—Case of the Missing Memory (Part III)	

Thursday (#409): How Animals See

6:00	**Eye Exam**—a visit to the ophthalmologist (Part I)	A4a,A4b

Length	Title and Description	Science Topics
1:00	**The Eye**—how it works	A4a
13:00	**How Animals See**—laboratory demonstrations	A1a,A4a,F3a
1:00	**Jeepers Creepers**—music video/ various animal eyes	B2b,A1b
3:00	**Through Animals' Eyes**—the world seen as they see it	A1b
2:00	**Light**—music video	B2b
2:00	**Eye Exam** (Part II)	A4a,A4b

Friday (#410): Bending And Bouncing

5:00	**Lighthouse**—an offshore light-bending machine (Part I)	B2a
2:00	**Light Island**—demonstrations: bending/bouncing (Part I)	B2a
1:00	**Lighthouse** (Part II)	B2a
2:00	**Light**—music video	B2b
2:00	**Light Island** (Part II)	B2a
6:00	**Mirror Telescope**—how it bends and refocuses light	B2a,C3b
9:00	**Lighthouse** (Part III)	B2a
:15	**Review Of Topics Covered**	

FARMS WEEK

Monday (#411): Sheep And Pigs

4:00	**Sheepshearing**—learning the art from experts (Part I)	A1b
2:00	**Farming**—music video	F3b
8:00	**Sheepshearing** (Part II)	A1b
3:00	**Pignews**—reports on genetic selection	A1b
11:00	**Sheepshearing** (Part III)	A1b

Tuesday (#412): Plants And Pigs

2:00	**Big-Scale Plants**—mass production agriculture	F3b
11:00	**Greg Partida**—visit with a plant-breeding expert	A2b,F3b
2:00	**Farming**—music video	F3b
4:00	**Pignews**—report on plant production	A1b
2:00	**Plant Production And Processing**—a mechanized approach	F3b
8:00	**Rubber Research**—breeding better rubber trees	A2b

Wednesday (#413): Hybrids

5:00	**Animal Emergency Room**—a pet visits the vet (Part I)	A1b, A4a
2:00	**Hybrids**—music video/mix 'n' match varieties	A1a
14:00	**Brangus**—a better breed of cattle	A1b
2:00	**Farming**—music video	F3b
6:00	**Animal Emergency Room** (Part II)	A1b,A4b

Length	Title and Description	Science Topics
9:00	**Family Farm**—a day in the life of a dairy (Part I)	F3b
1:00	**Dairy Machines**—modern practice	F3b
1:00	**Family Farm** (Part II)	F3b
1:00	**Shoes And Rouge**—music video/ cow products	F3b
3:00	**Pignews**—report on animal production (Part I)	F3b
2:00	**Farming**—music video	
6:00	**Family Farm** (Part III)	F3b
1:00	**Pignews** (Part II)	F3b
3:00	**Bloodhound Gang**—Case of Mr. Quickfingers (Part I)	
1:00	**Family Farm** (Part IV)	F3b

Friday (#415): Chickens And Pigs

2:00	**Farming**—music video	
15:00	**Chickens**—a high-volume, high-tech poultry farm	A1b,F3b
3:00	**Pignews**—report on animal production	F3b
2:00	**Gaggles, Flocks, And Herds**—lots of animals	A1a
3:00	**Bloodhound Gang**—Case of Mr. Quickfingers (Part II)	

STUFF WEEK

Monday (#416): Metals

4:00	**Repairing The Statue Of Liberty**—centennial spruce-up (Part I)	B1a,C1c,F3b
1:00	**Heat It, Beat It**—music video/ treating metal	B1a,B1b,F3b
3:00	**Stuffman**—different metals have different qualities	B1a,C1a
2:00	**Stuff**—music video/materials science	B1
5:00	**Repairing The Statue Of Liberty** (Part II)	B1a,C1c,F3b
1:00	**Did You Know**—amazing facts about materials	B1
1:00	**Repairing The Statue Of Liberty** (Part III)	B1a,C1c,F3b

Tuesday (#417): Clay

7:00	**Pottery Class**—Paco makes a pot (Part I)	B1a,B1c,F3b
2:00	**Stuff**—music video/materials science	B1
9:00	**The Toilet Zone**—how commodes are made	B1a,B1c,F3b
4:00	**Pottery Class** (Part II)	B1a,B1c,F3b
3:00	**Bloodhound Gang**—Case of the Dark Night (Part I)	
2:00	**Pottery Class** (Part III)	B1a,B1c,F3b

Length	Title and Description	Science Topics
Wednesday (#418): **Shaping It**		
7:00	**Forging A Keris**—a Malaysian steel dagger	B1a,B1b,B1c,F3b
1:00	**Heat It, Beat It**—music video/ treating metal	B1a,B1b,F3b
8:00	**Glass Artist**—his medium is clear and red-hot (Part I)	B1a,B1b,B1c,F3b
3:00	**Stuffman**—the properties of glass	B1a
2:00	**Glass Artist** (Part II)	B1a,B1b,B1c,F3b
5:00	**Bloodhound Gang**—Case of the Dark Night (Part II)	
Thursday (#419): **Feathers And Rubber**		
1:00	**Where Rubber Comes From**—tracing its path	A2,F3b
11:00	**Latex Makeup**—a teen becomes a werewolf	F3b
2:00	**Stuff**—music video/materials science	B1
8:00	**Feather Detective**—each bird species has its own feather design	A1b,F2,F3a
5:00	**Bloodhound Gang**—Case of Funny Money (Part I)	
Friday (#420): **Using It**		
11:00	**Egg Drop Contest**—kids design protective boxes for raw eggs	F3a,F3b
2:00	**Stuff**—music video/materials science	B1
9:00	**Bionic Bat**—human-powered plane built of man-made materials	B1a
5:00	**Bloodhound Gang**—Case of Funny Money (Part II)	

SEASON V

SIGNALS WEEK

Length	Title and Description	Science Topics
Monday (#501): **Lingo**		
2:00	**Diner Lingo**—the strange words waitresses use (Part I)	D1
1:00	**International Signs**—everyone understands them	D1
9:00	**Pyrenees Shepherd**—he can "talk" by whistling	D1
2:00	**Diner Lingo** (Part II)	D1
1:00	**Hello**—music video/nonverbal greetings	D1
1:00	**Linus Pauling**—a scientist talks to kids	F3a
8:00	**Native American Language**—words and hand signals	D1
1:00	**Nonverbal Language**—communicating without words	D1,A1b
1:00	**Diner Lingo** (Part III)	D1
Tuesday (#502): **Talking Birds, Talking Rooms**		
2:00	**Diner: Being Recognized**—different languages, different pronunciations (Part I)	D1
1:00	**Hello**—music video/nonverbal greetings	D1
1:00	**Big Words**—the sounds with which they communicate	
8:00	**The 100-Word Parrot**—learning what language is	A1b,D1
1:00	**And Now A Word From...**—various animal sounds	A1b,D1
7:00	**Voice-Activated Room**—it does what you tell it to	D2
2:00	**The X-Film**—a symbol has many meanings	D1
4:00	**Bloodhound Gang**—Case of the Human Whale (Part I)	
2:00	**Diner: Being Recognized**—each language has its own special sounds (Part II)	D1
Wednesday (#503): **Looking For Visual Clues**		
2:00	**Dog Tricks**—body language tips dogs off	A1b,D1
1:00	**Nonverbal Language**—communicating without words	A1b,D1
8:00	**Killer Whale Signals**—training a giant mammal	A1b,D1
1:00	**And Now A Word From...**—various animal sounds	A1b,D1
6:00	**Visiophone/Fiber Optics**—state-of-the-art phones	D2
1:00	**Hello**—music video/nonverbal greetings	D1
2:00	**The X-Film**—a symbol has many meanings	D1
1:00	**Review Of Topics Covered**	
5:00	**Bloodhound Gang**—Case of the Human Whale (Part II)	
Thursday (#504): **Getting Them Around**		
6:00	**Minitel/Smartcard**—consumer computer technology	D2,F3b
2:00	**Diner: Getting It Around**—microchips hold lots of information	D2
11:00	**Newspaper**—computers in the newsroom and the pressroom	D2,F3b
1:00	**International Signs**—everyone understands them	D1
3:00	**Data Transmission**—a TV picture is lots of bits of data	D2
5:00	**Bloodhound Gang**—Case of the Human Whale (Part III)	

Length	Title and Description	Science Topics
Friday (#505): **Cracking Codes**		
3:00	**Diner: Numbers Code**—a game of secret signals (Part I)	D1
6:00	**Chappe Telegraph**—long-distance communication without electricity	D1
1:00	**Hello**—music video/nonverbal greetings	D1
12:00	**Synthesizers**—machines that talk, read, make music	D2
1:00	**International Signs**—everyone understands them	D1
3:00	**Diner: Numbers Code** (Part II)	D1

OCEANS WEEK

Monday (#506): **On The Sea**		
12:00	**Hydrofoils And Hovercraft**—cutting-edge sea vessels	B3b,B3c
1:00	**Balls In The Surf**—they show how waves move	B3
3:00	**Wave Machine**—a lab demonstration of wave action	B3a,C4
1:00	**Motion In The Ocean**—all is not still below the surface	A1b
8:00	**The Wreck**—underwater search for a shipwreck (Part I)	A3,C4,F3a
Tuesday (#507): **In The Sea**		
1:00	**How To Move A Whale**—whale facts at an aquarium (Part I)	A1b
6:00	**The Cyana**—a deep-water submarine descends	B1a,B3b
2:00	**How To Move A Whale** (Part II)	A1b
7:00	**Natural And Artificial Reefs**—a sunken ship is home to fish	A1a,C4
1:00	**How To Move A Whale** (Part III)	A1b
2:00	**You Take My Breath Away**—music video/staying underwater	A1b
4:00	**How To Move A Whale** (Part IV)	A1b
5:00	**The Wreck**—underwater search for a shipwreck (Part II)	A3,C4,F3a
Wednesday (#508): **From The Sea**		
5:00	**Sea Survival**—a solo-Atlantic-crossing vet tells how	A4
1:00	**Why Is The Sea Salty?**—the secret's on land	C1c,C2,C4
1:00	**Kelp Song**—music video/underwater plants	A2,F3b
1:00	**Man In The Street**—asking "what's kelp?"	A2,F3b
9:00	**Kelp**—how it grows, and how it's cut	A1a,A2a,A2b,C4
1:00	**Oceanographer**—music video/a science profession	E
7:00	**The Wreck**—underwater search for a shipwreck (Part III)	A3,C4,F3a
1:00	**The Ocean**—a review of concepts	

Length	Title and Description	Science Topics
Thursday (#509): **By The Sea**		
1:00	**The Ocean**—a review of concepts	
5:00	**Jill Yager**—oceanographer explores an island (Part I)	A1a,C4,E
1:00	**Sea Creatures**—strange ocean dwellers	A1a,A1b
6:00	**Jill Yager** (Part II)	A1a,C4E
1:00	**Motion In The Ocean**—all is not still below the surface	A1b
2:00	**Jill Yager** (Part III)	A1a,C4,E
1:00	**Animals Getting In The Ocean**—each in its own way	A1b
9:00	**The Wreck**—underwater search for a shipwreck (Part IV)	A3,C4,F3a
Friday (#510): **Of The Sea**		
1:00	**Oceanographer**—music video/a science profession	E
4:00	**Climate Research**—out to sea to study weather	C2,F1
1:00	**Why Is The Sea Salty?**—the secret's on land	C1a,C1c
1:00	**Penguins**—cute, cool birds	A1
12:00	**Penguin Encounter**—at an aquatic park in California	A1b
1:00	**Motion In The Ocean**—all is not still below the surface	A1b
9:00	**The Wreck**—underwater search for a shipwreck (Part V)	A3,C4,F3a

MOTION WEEK

Monday (#511): **What's Up?**		
2:00	**Maggie's Machine Shop**—pulleys add power	B3c
11:00	**Quarry**—cutting granite in Vermont	B3c,C1c
1:00	**Uneven Parallel Bars**—a gymnast plays with gravity	B2d,B3a
1:00	**Motion**—music video/physical forces	B3
4:00	**Eiffel Tower Elevator**—counterweights make it efficient	B3c
1:00	**Canal Locks**—rising to the occasion	B3c,F3b
4:00	**Bike Riding Uphill**—a bicycle's like an elevator	B3c
1:00	**Review Of Topics Covered**	
Tuesday (#512): **Bones**		
3:00	**Bike Riding Skeleton**—bones are your body's levers	A4a
1:00	**Motion**—music video/physical forces	B3
12:00	**Horse Doctor**—a vet tends to a horse's legs	A1b,E
1:00	**Elephants Don't Jump**—they're not built for it	A1b
9:00	**Human Locomotion**—running and walking are different motions	A4a
1:00	**Review Of Topics Covered**	

Length	Title and Description	Science Topics

Wednesday (#513): Smashing

1:00	**Motion**—music video/physical forces	B3
15:00	**Stage Fighting**—how to create the illusion of impact	B3b
:30	**Egg Safety**—a smashing ride without seat belts	B2d,B3a
5:00	**Train Crash Lab**—designs to absorb impact	B3a
3:00	**Coefficient Of Restitution Show**—measuring bounce	B2d,F1
1:00	**Kangaroos**—bouncing animals	A1b,A3
1:00	**Trampoline**—a bouncing gymnast	B3
1:00	**Linus Pauling**—a scientist talks to kids	F3a
1:00	**Review Of Topics Covered**	

Thursday (#514): Getting A Grip

1:00	**Friction!**—music video/the rubbing force	B3b
7:00	**Ice Boat**—minimal friction, maximal speed	B3b
1:00	**Steve Weinberg**—a scientist talks to kids	F3a
10:00	**Snake Motion**—they push off against their own bodies	A1b,B3a
1:00	**Snakes**—in all their glory	A1
7:00	**TGV Train**—high speed train of France	B2d,B3a
1:00	**Review Of Topics Covered**	

Friday (#515): Heave Ho!

5:00	**Tugboat**—leverage in the harbor (Part I)	B3b
2:00	**Maggie's Machine Shop**—levers and fulcrums	B3a
10:00	**Sculling**—leverage in water sport	B2d,B3a
3:00	**Obelisk Raising**—leverage restores ancient monument	B3d
5:00	**Tugboat** (Part II)	B3b

EATING WEEK

Monday (#516): Tooth Detectives

1:00	**Incisor**—a special kind of tooth	A4
7:00	**Trip To The Dentist**—a checkup and a filling (Part I)	A4b
2:00	**Animal Teeth**—music video/many shapes and colors	A1b
2:00	**Paco's Kitchen**—teeth are tools in your mouth	A4a
6:00	**Tooth Detective**—a tooth identifies an animal	A1a,A1b,F3a
2:00	**Herbivore, Carnivore, Omnivore**—music video/they are what they eat	A1
2:00	**Name That Tooth**—telltale characteristics	A1
5:00	**Trip To The Dentist** (Part II)	A4b
1:00	**Animal Teeth**—music video/many shapes and colors	A1b

Length	Title and Description	Science Topics

Tuesday (#517): Picky Eaters

2:00	**Herbivore, Carnivore, Omnivore**—music video/they are what they eat	A1
3:00	**Picky Eaters**—the pygmy hippo (Part I)	A1b
2:00	**Hummingbirds**—tiny, hungry birds	A1
8:00	**Fleas**—a scientist discusses their variety	A1a,A1b
5:00	**Picky Eaters**—the koala (Part II)	A1b
1:00	**Joel De Ronay**—a science educator talks to kids	A1b
7:00	**Picky Eaters**—the panda (Part III)	A1b

Wednesday (#518): Zoo Food

5:00	**Zoo Food**—feeding is a complex business (Part I)	A1b
2:00	**Herbivore, Carnivore, Omnivore**—music video/they are what they eat	A1
2:00	**Man On The Street**—are you an herbivore, a carnivore, or an omnivore?	A4
4:00	**Zoo Food**—what elephants eat (Part II)	A1b
2:00	**Zoo Food**—what lions eat (Part III)	A1b
3:00	**Paco's Kitchen**—what's a protein	B1c
3:00	**Zoo Food**—what flamingos eat (Part IV)	A1b
2:00	**Miriam Rothschild**—a scientist talks to kids	E
6:00	**Bloodhound Gang**—Case of the Haunted House (Part I)	

Thursday (#519): Down The Hatch

2:00	**Man On The Street**—where are your digestive organs?	A4a
1:00	**Paco's Kitchen**—the digestive tract	A4a
9:00	**Pigs**—looking inside a pig's digestive tract	A1b,A4a
1:00	**The Liquidator**—a spider's external digestion	A1b
1:00	**Man On The Street**—what's an enzyme?	A4a
1:00	**Paco's Kitchen**—what enzymes do	A4a,B1c
3:00	**Lactose Intolerance**—a boy who can't drink milk	A4
2:00	**Paco's Kitchen**—a digestion experiment	A4a
3:00	**Glucose**—sloth makes you sleepy	A4
1:00	**Paco's Kitchen**—David's gastrointestinal T-shirt	A4a
5:00	**Bloodhound Gang**—Case of the Haunted House (Part II)	

Friday (#520): Leftovers

2:00	**Paco's Kitchen**—your body leaves leftovers, too	A4a
15:00	**Prehistoric Diet**—petrified feces provide some clues	A4a,F3a
1:00	**Paco's Kitchen**—what enzymes do	A4a,B1c
1:00	**Man On The Street**—what's an enzyme?	A4a
7:00	**Bloodhound Gang**—Case of the Haunted House (Part III)	A4a

SEASON VI

JAPAN WEEK

Length	Title and Description	Science Topics
Monday (#601): **Precious Oysters, Rare Salamanders**		
2:00	**Fish Market In Tokyo**—David and Kaori go shopping	A1a
2:00	**The Early Life Of Oysters**—how they grow	A1b
10:00	**Growing Cultured Pearls**—visit to a pearl "farm"	A1b,A3,F3b
9:00	**Giant Salamanders**—a rare Japanese species	A1a,A1b,A3
2:00	**Endangered**—music video/ endangered species	A3
Tuesday (#602): **Landslide!**		
7:00	**As Mt. Fuji Erodes**—civil engineering project protects nearby villages (Part I)	C1a
1:00	**The Damage A Landslide Can Do**	C1a
7:00	**As Mt. Fuji Erodes**—why it happens (Part II)	C1a
7:00	**Landslide Lab**—home of the artificial rainstorm	C1a,F3a
2:00	**Japanese Kids Speak Out**—about science	D1
1:00	**Review Of Topics Covered**	
Wednesday (#603): **Paper And Kites**		
8:00	**Tea Ceremony**—Kaori's mom teaches David an old Japanese tradition	D1
14:00	**Old-Fashioned Paper**—how it's long been made	F3a
5:00	**Kites**—making them, flying them, and using science to improve them	F3a
Thursday (#604): **Earthquake!**		
3:00	**Earthquake Safety Drill**—at a Japanese school	C1a, D1
2:00	**The Damage An Earthquake Can Do**	C1a
4:00	**Keeping Track Of Quakes**—visit to a monitoring lab	C1d,F1,F2
8:00	**Earthquake-Proof Buildings**—engineering ideas	F1,F2,F3a
1:00	**Traditional Buildings That Quakes Don't Break**	B1a
5:00	**Joinery**—demonstration of nail-less carpentry	F3b
1:00	**Japanese Kids Speak Out**—about science	D1
1:00	**Yoshikazu Kitagawa**—quake expert talks to kids	C1a,E
:30	**Review Of Topics Covered**	
Friday (#605): **Judo And Computers**		
5:00	**Classroom Kanji**—learning the writing system	D1
:30	**Kanji**—animation	D1
6:00	**This Computer Reads Kanji**—pattern recognition	D2
3:00	**School Lunch**—it's not peanut butter and jelly	D1
1:00	**Japanese Kids Speak Out**—about science	D1
4:00	**Computer Judo Coach**—analyzing martial motion	B3a,D2,F1,F2
1:00	**Review Of Topics Covered**	
3:00	**Kanji In The Garden**—practice and examples	D1

DETECTIVES WEEK

Length	Title and Description	Science Topics
Monday (#606): **Skin And Bone Detectives**		
3:00	**Mayan Artifacts**—clues archeologists work with	F2,F3a
14:00	**Portrait Of A Mummy**—interpreting X-rays	A4b,F1,F2
2:00	**How Do You Know?**—music video/ clues and senses	F3a
8:00	**Prehistoric Flint Mine**—who were the miners?	F2,F3,F3a
1:00	**Review Of Topics Covered**	
Tuesday (#607): **Tool And Trash Detectives**		
9:00	**Clues In The Garbage**—archeology in a modern city	F1,F2,F3
2:00	**Garbage Ballad**—music video/ garbage as evidence	F2,F3
1:00	**Richard Leakey**—an archeologist talks to kids	E
10:00	**Stone Tools**—signs of ancient humans in Kenya	F2,F3
3:00	**Making Stone Tools**—accurate reproductions	F3a,F3b
2:00	**How Do You Know?**—music video/ clues and senses	F3a

Length	Title and Description	Science Topics

Wednesday (#608): Wildlife Detectives

15:00	**Owls In The Wild**—using your senses to find them	A1a,A1b,F2
1:00	**Owls**—a montage of the many varieties	A1a
4:00	**Ruth Melichar**—she looks after injured wild birds	A1a
6:00	**Salt Marsh**—variety of life in an ecosystem	A1a,A1b,A3
2:00	**How Do You Know?**—music video/ clues and senses	F3a

Thursday (#609): Dinosaur Detectives

1:00	**Moving A Dinosaur**—installing an exhibit (Part I)	
10:00	**Dinosaur Artist**—sculpting from fossil clues	A1b,F3b
1:00	**How Fossils Are Made**—animation	C1a
2:00	**Moving A Dinosaur** (Part II)	
2:00	**Bone Tour**—working with fossils in a museum	E
1:00	**Chicken Skeleton**—how bones fit together	A1b
6:00	**Dinosaur Nursery**—where fossils are found	A1a,F2,F3
1:00	**Stephen Jay Gould**—a scientist talks to kids	E
1:00	**Moving A Dinosaur** (Part III)	
2:00	**How Do You Know?**—music video/ clues and senses	F3a
1:00	**Review Of Topics Covered**	

Friday (#610): Pattern Detectives

4:00	**Scanning Electron Microscope**—high-tech detection	F2
9:00	**Dating Trees**—clues hidden in tree rings	F1,F2,F3a
2:00	**How Do You Know?**—music video/ clues and senses	F3a
2:00	**Facial Recognition**—printed photos are lots of dots	F2
7:00	**Fingerprints**—how police detectives use them	D2,F2,F3
1:00	**Review Of Topics Covered**	

ARCHITECTURE WEEK

Monday (#611): Raising The Big Top

1:00	**Architecture Song**—music video	F3b
3:00	**Big Top**—taking down a circus tent (Part I)	B3c,F3b
2:00	**Tents**—a tour of tents the world over	
1:00	**Skin And Bones**—music video/ building is like a body	F3b
2:00	**As The Bean Bends**—animation/ tension and compression	B3b

Length	Title and Description	Science Topics

13:00	**Big Top**—taking down a circus tent (Part II)	B3c
1:00	**Raising The Roof**—an arena's inflatable roof	B1a
1:00	**Teepee**—a large, Native American tent	F3b
1:00	**Review Of Topics Covered**	

Tuesday (#612): Home

1:00	**Shelter**—music video	C2
1:00	**House Framing**—putting up the skeleton	F3b
9:00	**Home In A Day**—a Masai house in Kenya	B1a
1:00	**Skin And Bones**—music video/ building is like a body	F3b
3:00	**Made To Fit**—architecture by animals	A1b
6:00	**Joinery**—nail-less woodwork in Japan	F3b
1:00	**Traditional Japanese Architecture**—examples	F3b
1:00	**Can It Be Done?**—how to span even larger distances	F3b
1:00	**Architecture Song**—music video	F3b
1:00	**Review Of Topics Covered**	

Wednesday (#613): Stack It Up

3:00	**How To Build An Arch**—demonstration with wooden blocks (Part I)	B3c
5:00	**Cathedral**—building with 300-ton stones (Part I)	B1a,F3b
1:00	**How To Build An Arch**—with buttresses (Part II)	B3c
1:00	**Architecture Song**—music video	F3b
1:00	**Can It Be Done?**—how to span even larger distances	F3b
2:00	**As The Bean Bends**—animation/ tension and compression	B3b
4:00	**Cathedral**—designing and carving stones (Part II)	B1a,F3b
2:00	**Can It Be Done?**—an enormous arch in St. Louis	B1a,F3b
6:00	**Cathedral**—setting a stone in place (Part III)	B1a,F3b
1:00	**Review Of Topics Covered**	

Thursday (#614): Made To Fit

2:00	**Ergonomics**—design for human comfort	F1
8:00	**Quinn's Kitchen**—testing with a computer	D2,F1,F2
3:00	**Made To Fit**—architecture by animals	A1b
2:00	**Wrecking Ball**—scenes of demolition	F3b
5:00	**Carlton Brown**—a day in an architect's life	E
1:00	**Shelter**—music video	C2
7:00	**Solar Hogans**—modern Navajo dwellings	B2c
1:00	**Review Of Topics Covered**	

Length	Title and Description	Science Topics
Friday (#615): **Light But Strong**		
1:00	**Architecture Song**—music video	F3b
2:00	**Why An "I"**—story of an I-beam	B1a
2:00	**Skyscraper**—how many kinds are built	F3b
6:00	**Raising The Roof**—an arena's inflatable roof	B1a,F3b
2:00	**As The Bean Bends**—animation/ tension and compression	B3
2:00	**Three Sides In Four**—diagonal crossbraces add strength to rectangles	B3,F3b
10:00	**Tough Towers**—building with balsa wood	B1a,F3a
1:00	**Review Of Topics Covered**	

MAMMALS WEEK

Monday (#616): **Rats And Bats**		
1:00	**Mammal Gospel**—music video	A1a
7:00	**Telltale Teeth**—classifying animals	A1a,A1b
1:00	**Mouse House**—rodent varieties	A1a
8:00	**Coypu, The Rodent**—an unusual pest in England	A3
6:00	**Bats In Jars**—in a lab: hundreds of varieties	A1a,F2
1:00	**Mammalogist Song**—music video	E
1:00	**Stephen Jay Gould**—a scientist talks to kids	E
1:00	**Review Of Topics Covered**	
Tuesday (#617): **Keeping Warm**		
4:00	**Fur Detective**—tracking down a mammal (Part I)	A1a
1:00	**Hair!**—music video	A1,A4a
10:00	**Sea Otters**—warmth in the cold Pacific	A1b,A3
1:00	**Shrews**—animation	A1b
2:00	**Mammal Gospel**—music video	A1
7:00	**Fur Detective**—tracking down a mammal (Part II)	A1a
1:00	**Edward O. Wilson**—a scientist talks to kids	E,F3a
1:00	**Mammalogist Song**—music video	E
1:00	**Fur Detective** (Part III) **/Review Of Topics Covered**	
Wednesday (#618): **Live Birth, Warm Milk**		
1:00	**Baby Times**—music video/ gestation periods	A1b,A4a
8:00	**Elephant Seals**—birthing and nursing on the beach	A1b
1:00	**Red Kangaroo**—growing up in a pouch	A1a,A1b
2:00	**Wildebeest Birth**—on the African plains	A1b
1:00	**Mammalogist Song**—music video	E
13:00	**Black Bears**—growing up in Pennsylvania woods	A1b
1:00	**Just Stand Up**—baby animals learn how	A1b
:30	**Review Of Topics Covered**	
Thursday (#619): **At Play**		
1:00	**Kids At Play**—watching young humans	A1b,A4b
1:00	**Mammals At Play**—fun and learning	A1
12:00	**Baboon Community**—learning from each other	A1b,A3,F2
1:00	**Mammalogist Song**—music video	E
5:00	**Sheep Dogs**—breeding for specific behaviors	A1b
1:00	**Hair!**—music video/many species, many kinds	A1,A4a
4:00	**Chimps At The Zoo**—solving problems at feeding time	A1b
2:00	**Mammal Gospel**—music video	A1
:30	**Review Of Topics Covered**	
Friday (#620): **Big Mammals— The High Cost Of Living**		
2:00	**Pandas**—rare mammals visit a New York zoo	A1a,A1b,A3
6:00	**Rhino Patrol**—protecting rhinos in Kenya	A1a,A1b,A3
2:00	**Tapir**—a rare mammal with common kin	A1b
1:00	**Horse Evolution**—a brief history	A1b
2:00	**Running With The Wind**—music video/horses	A1
2:00	**Round Up**—corraling wild horses to save them	A3
2:00	**Hippos**—a look at their lives	A1b
2:00	**Elephants**—big problems: less land to live on	A1b
:30	**Review Of Topics Covered**	

MODELING WEEK

Monday (#621): **Things On Wheels**		
3:00	**What's A Model?**—the principles of modeling	F3
9:00	**Olympics Of The Mind**—kids build model car	F3,F3b
1:00	**Construction Firsts**—some worked, others didn't	
10:00	**Model Racing Cars**—testing, tinkering, and racing	F3
2:00	**New Jersey Steamers**—model steam trains	
2:00	**Modeling**—music video	F3
1:00	**Review Of Topics Covered**	
Tuesday (#622): **Through Ice And Air**		
3:00	**What's A Model?**—the principles of modeling	F3

Length	Title and Description	Science Topics
9:00	**Model Ice**—a scale-model frozen sea in Canada	F3a
1:00	**Construction Firsts**—some worked, others didn't	
5:00	**Superbikes**—how to build a fast bicycle	B3a,F3a
1:00	**Laminar Flow**—fish shapes move faster	B3a
2:00	**Modeling**—music video	F3
6:00	**Woodrow Whitlow**—a scientist uses models to design airplanes	E
1:00	**Review Of Topics Covered**	

Wednesday (#623): The Earth

3:00	**What's A Model?**—The principles of modeling	F3
8:00	**Surveying**—gathering data for maps	C1d,F1
3:00	**Making A Globe**—Earth's largest model Earth	C1d,F1
1:00	**Maps**—animation history of Earth maps	C1d
9:00	**Mapping A Familiar Place**—1st graders map their neighborhood	C1d,F1
2:00	**Modeling**—music video	F3
1:00	**Steve Weinberg**—a scientist talks to kids	F3a
1:00	**Review Of Topics Covered**	

Thursday (#624): Knees And Small Things

8:00	**Miniatures**—building tiny models for museums	F1
1:00	**Dinosaur Matrix**—animation the concept of scale	F1
3:00	**What's A Model?**—the principles of modeling	F3
1:00	**Body Electric**—tools to show what goes on in our bodies	A4,F1
13:00	**Bone Makers**—building an artificial human knee	A4,B1a,F3b
2:00	**Modeling**—music video	F3

Friday (#625): Spaces

2:00	**Modeling**—music video	F3
18:00	**Zoo Habitat**—an artificial rain-forest home	B1a,F3b
3:00	**What's A Model?**—the principles of modeling	F3
4:00	**Linus Pauling**—scientist uses mental model to crack a puzzle	F2,F3a

IN THE AIR WEEK

Monday (#626): Finding Your Way

11:00	**Bats On The Wing**—sight, hearing, and navigation	A1b
1:00	**Bat**—animation/aerial sonar in the dark	A1b,F1
1:00	**Butterflies**—they shiver to warm up for flight	A1b
7:00	**Pigeons**—how homing pigeons find their way	A1b
1:00	**Animal Navigation**—music video	A1b,C1d
5:00	**Bird Banding**—a way to keep track of migrators	A1b
1:00	**Review Of Topics Covered**	

Tuesday (#627): Drifting With The Wind

2:00	**Flying Scooters**—introducing wind power	
11:00	**Soaring**—a trip in a glider	B3a,C2
1:00	**Flight**—a "commercial" for the airborne	
7:00	**Balloon Race**—hot-air ballooning in Colorado	B1a,B1d
1:00	**Hot-Air Balloon**—animation/why a balloon rises	B1b,B2
5:00	**Kites**—using science to improve them	F3a,F3b
1:00	**Review Of Topics Covered**	

Wednesday (#628): Born To Fly

:30	**Playland Yo-Yo**—introducing flying animals	
6:00	**Butterfly Aviary**—butterflies need to fly	A1b
1:00	**Butterflies**—monarch butterflies migrate	A1b,C1d
3:00	**Insects In Drawers: Dragonflies**—ancient acrobatic fliers	A1a,A1b
3:00	**Evolution Of Flight**—a brief history	A1b
2:00	**Insects In Drawers: Moths**—living by night	A1a,A1b
8:00	**Honeybee Dance**—messages from one bee to others	A1b,F3,F3a
2:00	**Insects In Drawers: Beetles**—one design, many variations	A1a
1:00	**Flight**—a "commercial" for the airborne	
1:00	**Review Of Topics Covered**	

Thursday (#629): Fat Things That Fly

10:00	**Ladybugs**—flight in their life cycle	A1a,A1b,A3
2:00	**Insects In Drawers: Beetles**—one design, many variations	A1a,A1b
5:00	**Blimp**—aloft in a lighter-than-air craft	B1a,B3a
1:00	**Flight**—a "commercial" for the airborne	
9:00	**Balls In Flight**—a softball's journey	B3a
1:00	**Review Of Topics Covered**	

Friday (#630): Unbelievable Flying Object

2:00	**Playland Whirl**—introducing the topic	
14:00	**The Robot Pterodactyl**—an amazing simulation	A1b,F3a
1:00	**Flight**—a "commercial" for the airborne	
7:00	**Rutan's Flying Machines**—designed for a purpose	B1b
1:00	**Review Of Topics Covered**	

SEASON VII

Length	Title and Description	Science Topics

ANTARCTICA WEEK

Monday (#701): Getting There

:30	**Antarctica**—where in the world is it?	C1,C2
15:00	**Getting There**—flight to the bottom of the world	C1,C2
2:00	**Antarctica**—what's it like?	C1
1:00	**North Pole/South Pole**—animation/which is which?	C1D
4:00	**Emperor Penguins**—they move elegantly, but why?	A1
3:00	**Livin' On The Edge**—music video/ Antarctica's creatures all live near the coast	A1,A3

Tuesday (#702): Getting Around

4:00	**Shackleton's Hut**—base camp of pioneering explorers	C1b
5:00	**Early Explorers**—the first to trek to the South Pole	C1b,C2,C4
6:00	**Crevasse**—how to survive when the ice opens up	C1b
2:00	**Spryte**—a special vehicle for Antarctic travel	B3c
1:00	**North Pole/South Pole**—animation/which is which?	C1d
9:00	**Getting To The South Pole**—how it's done today	C1b

Wednesday (#703): Life On The Edge

5:00	**Getting There**—flight to the bottom of the world	C1,C2
2:00	**Antarctica**—what's it like?	A1,C1
1:00	**Antarctica Facts**—the South Pole's a special place	C1b
1:00	**North Pole/South Pole**—animation/which is which?	C1d
3:00	**Adele Penguin Rookery**—birds at the breeding ground	A1
9:00	**Weddell Seals**—tracking and tagging a species	A1
3:00	**Livin' On The Edge**—music video/ Antarctica's creatures all live near the coast	A1,A3
4:00	**Emperor Penguins**—they move elegantly, but why?	A1

Thursday (#704): Life Under The Ice

:30	**Antarctica Facts**—seasons of light and temperature	C2
2:00	**Antarctica**—what's it like?	C1
8:00	**Jellyfish**—diving in the sea to collect jellyfish below the ice	A1
2:00	**Observation Tube**—climbing down to look beneath the ice	C4
2:00	**Scientist Song**—music video/an exciting profession	E
3:00	**Adele Penguin Rookery**—birds at the breeding ground	A1
3:00	**Livin' On The Edge**—music video/ Antarctica's creatures all live near the coast	A1,A3
6:00	**Not Frozen Fish**—fish with antifreeze in their bodies	A1
1:00	**North Pole/South Pole**—animation/which is which?	C1d

Friday (#705): The Desert Continent

5:00	**Getting There**—flight to the bottom of the world	C1,C2
:40	**Antarctica Facts**—the continent is a frozen desert	C2
2:00	**Antarctica**—what's it like?	C1
4:00	**Know Your Weather**—a rule of Antarctic safety	C2
1:00	**North Pole/South Pole**—animation/which is which?	C1d
13:00	**Dry Valleys**—Antarctica's no-snow spots	C1b

YOUR BODY WEEK

Monday (#706): Twins

2:00	**Twins Party**—scores of twins meet and greet (Part I)	A4
1:00	**Twinning**—animation/the conception of identical twins (Part I)	A4a
:30	**Twinning**—animation/the conception of fraternal twins (Part II)	A4a
2:00	**Chromosomes And Fetal Development**—microphotography	A4a
1:00	**Twins Party** (Part II)	A4
7:00	**Twins Physical**—a doctor tells twins why they're twins	A4
2:00	**Twins Party** (Parts III-IV)	A4
2:00	**How Do You Know?**—music video/ how scientists find things out	
7:00	**Bloodhound Gang**—Case of the Educated Pig	

Tuesday (#707): Having A Baby

1:00	**Egg And Sperm**—conception	A4
1:00	**Having A Baby**—the family visits a sibling class (Part I)	A4
:20	**Fetal Development**—happens before babies are born	A4
3:00	**Having A Baby**—the family visits a hospital nursery (Part II)	A4
6:00	**Having A Baby**—ultrasound examination (Part III)	

Length	Title and Description	Science Topics
1:00	**Baby Times**—music video/gestation periods	A1
2:00	**Having A Baby**—baby comes home (Part IV)	A4
1:00	**Jesse 0 to 1**—baby's first year	A4
3:00	**Having A Baby**—a visit to the pediatrician (Part V)	A4
2:00	**Human Growth**—music video/how bones and muscles develop	A4

Wednesday (#708): Sleep

2:00	**Sleep Commercial**—it's an easy sell!	A4
9:00	**Sleep Lab**—scientists study the stages of sleep	A4,F
2:00	**My Body**—music video/an incredible machine	A4
7:00	**Bioelectricity**—there's electricity in all living things	A1,B2a,F
1:00	**Electric Animals**—meet a few real shockers	A1
6:00	**Bloodhound Gang**—Case of the 264-Pound Burglar (Part I)	

Thursday (#709): Spinning

2:00	**Spinning**—a look at creatures and things in spin	B32
8:00	**Dancers In Spin**—the Laura Dean Troupe doesn't get dizzy	A42,B3a
1:00	**Inner Ear**—animation/how balance is maintained	A4a
8:00	**High-Tech Discus**—computer aid for an Olympic athlete	B3a
5:00	**Bloodhound Gang**—Case of the 264-Pound Burglar (Part II)	

Friday (#710): Your Health

2:00	**My Body**—music video/an incredible machine	A4
1:00	**Hospital**—getting to the hospital (Part I)	A4b
9:00	**Flying Nurse**—an airborne ambulance in Africa	A4b
2:00	**Hospital**—quick care in an emergency (Part II)	A4b
2:00	**Living River**	
8:00	**Malaria Control**—testing children in a small Kenyan village	A1,A4b
1:00	**Hospital**—how blood is tested (Part III)	A4b
2:00	**How Do You Know?**—music video/clues and senses	F
1:00	**Hospital**—recap (Part IV)	A4b

AUSTRALIA WEEK

Monday (#711): Platypus And Echidnas

3:00	**Australia**—where is it? what is it?	A1,C1b
3:00	**Gondwanaland**—animation/the ancient super-continent	C1a
12:00	**Platypusing**—hunting for the duckbilled creature	A1
1:00	**Echidnas**—the way they live	A1
2:00	**Mammal Gospel**—what platypus, echidnas, and people have in common	
5:00	**Tracking Echidnas**—the spiny anteater	A1,F3
3:00	**Echidna Birth**—how they enter the world	A1

Tuesday (#712): Moths And Beetles

3:00	**Australia**—where is it? what is it?	A1,C1b
3:00	**Gondwanaland**—animation/the ancient super-continent	C1a
10:00	**Moth Hunting**—important food for ancient aborigines	A1
1:00	**Dung Beetle**—a close-up look	A1
11:00	**Eating Dung**—beetles that help keep pastures clean	A1

Wednesday (#713): Emu And Kookaburra

3:00	**Australia**—where is it? what is it?	A1,C1b
3:00	**Gondwanaland**—animation/the ancient super-continent	C1a
17:00	**Bird Watching**—unusual birds native to Australia	A1,F2
1:00	**Big Birds Don't Fly**—Australia's emus	
3:00	**Mallee Fowl**—big, big birds	A1

Thursday (#714): Koalas

3:00	**Australia**—where is it? what is it?	A1,C1b
3:00	**Gondwanaland**—animation/the ancient super-continent	C1a
11:00	**Eating Leaves**—how koalas get their food (Part I)	A1,A3
2:00	**Marsupials**—music video/mammals with pouches	A1
8:00	**Eating Leaves**—what's in eucalyptus leaves (Part II)	A1,A3
2:00	**Koalas**—film and animation summary	A1

Friday (#715): Kangaroos

4:00	**Australia**—where is it? what is it?	A1,C1b
3:00	**Gondwanaland**—animation/the ancient super-continent	C1a
2:00	**Kangaroos**—a large gathering	A1
10:00	**Kangaroo Survey**—counting them from the air	F
2:00	**Kangaroo Facts**—lifestyles of the tall and hoppy	A1
2:00	**Marsupials**—music video/mammals with pouches	A1
4:00	**Birth Of A Kangaroo**—and life in a pouch	A1

STRUCTURES WEEK

Monday (#716): Bubble, Bubble

2:00	**Bubbles**—the principle of surface tension (Part I)	B1,B3b
13:00	**Bubble Festival**—wonders with soapy water	B1,B3b

Length	Title and Description	Science Topics
1:00	**Bubbles**—covering the minimal surface (Part II)	B1,B3b
2:00	**Structures Song**—music video/ structures and reasons	B1
1:00	**Bubbles**—the bubbliest way between three points (Part III)	B1,B3b
7:00	**Glassblower**—working with a very viscous liquid	B1,B3b
2:00	**Bubbles**—blowing patterns in froth (Part IV)–	B1,B3b
1:00	**Bubble Recipe**—how to blow your own bubbles	B1,B3b

Tuesday (#717): Pipes And Reeds

1:00	**Tube Catalog**—a world of tubes, natural and human-made	B1a
1:00	**Structures Song**—music video/ structures and reasons	B1
1:00	**Tube Strength**—an experiment with a piece of plain paper	B1a
1:00	**Bikes**—what makes a bike Olympic-fast?	B3c
8:00	**Handmade Bikes**—building a fast bicycle	B1a,F3b
2:00	**Pipe Organ**—the wonderful sounds that come out of tubes	F3b
1:00	**Reeds**—tubes that occur in nature	B1a
8:00	**Thatching**—using nature's reeds to build a strong roof	F3b
4:00	**Tubes And Volume**—which shape holds the most?	F1

Wednesday (#718): Chaos And Crystals

4:00	**Making Crystals**—mixing the ingredients (Part I)	B1d
2:00	**Structures Song**—music video/ structures and reasons	B1
2:00	**Waiting For Snow**—trying to catch and examine flakes	B1d
2:00	**Snow**—flake by flake, and piled deep	B1d
11:00	**Snowflakes**—how they take their unique shapes	B1d
2:00	**Scientist Song**—music video/an exciting profession	E
3:00	**Science Fair**—kids explain their projects	F
1:00	**Crystals Growing**—time-lapse photography	B1d
1:00	**Making Crystals**—the crystallized product (Part II)	B1d

Thursday (#719): Running Robots

3:00	**Maze Running**—what must a hamster know to find its way?	A1b,F2
12:00	**Leg Lab**—moving and maintaining balance all at once	D2
1:00	**Gyroscopes**—as they spin, they help keep you on course	C1d
2:00	**Scientist Song**—music video/an exciting profession	E
6:00	**Robot Shapes**—robots help build autos/androids don't	D2,F3b
2:00	**Structures Song**—music video/ structures and reasons	B1
1:00	**Pogo**—learning to jump on a springy stick	D2

Length	Title and Description	Science Topics

Friday (#720): Suspended In Air

2:00	**Structures Song**—music video/ structures and reasons	B1
2:00	**Spirals**—spirals in a rope help it stretch when you fall	B3b
14:00	**Dynamic Ropes**—manufacturing them and climbing with them	B1a,B3b,F3b
2:00	**Scientist Song**—music video/an exciting profession	E
6:00	**Vine Divers**—high dive with a natural measure of safety	B3b,B1a

GREECE WEEK

Monday (#721): The Journey Begins

5:00	**Leaving New York City**—preparing for the trip	C1a
1:00	**Greece**—where in the world is it?	C1d
2:00	**Corinth Canal**—a sea-to-sea short-cut built by humans	C1b
2:00	**At A Cafe**—an orienting chat in Athens	C1d
5:00	**Caldera**—a sleeping volcano and the lake it formed (Part I)	C1
1:00	**Magma**—animation/how iron deposits rise from the earth	C1
4:00	**Caldera**—the volcanic lake is a natural lab (Part II)	C1
1:00	**Volcanic Change**—animation/a volcano reshaped an island	C1a
5:00	**Caldera**—geological proof of volcanic action (Part III)	C1
2:00	**Santorini**—this Greek island shows the Earth is alive	

Tuesday (#722): Under The Ash

1:00	**Atlantis**—is the myth a reality on the island of Santorini?	
1:00	**Greece**—where in the world is it?	C1d
1:00	**Volcanic Change**—animation/a volcano reshaped an island	C1a
2:00	**Io**—an 800-year-old city built into steep cliffs	
1:00	**Ancient Thira**—a 1,000-year-old city in ruins (Part I)	C1,F
5:00	**Akrotiri**—an archeological dig, a 5,000-year-old city (Part I)	C1,F
2:00	**Ancient Thira**—it takes imagination to "see" the city (Part II)	C1,F
3:00	**Akrotiri**—older than Thira, but better preserved (Part II)	C1,F
2:00	**The Boat**—a reconstruction from ancient frescoes	F3
7:00	**Learning From Frescoes**—ancient paintings hold information	F

Wednesday (#723): Before History

1:00	**Atlantis**—is the myth a reality on the island of Santorini?	
1:00	**Greece**—where in the world is it?	C1d

Length	Title and Description	Science Topics
6:00	**Donkey Ride**—transportation on a rocky, hilly island	
1:00	**Volcanic Change**—animation/a volcano reshaped an island	C1a
7:00	**Akrotiri**—how archeologists dig out the story (Part III)	C1,F
7:00	**Before Akrotiri**—6,000-year-old jars suggest history's course	C1,F
4:00	**Atlantis**—comparing a myth to archeological facts	F

Thursday (#724): Sheep And Cheese

1:00	**Greece**—where in the world is it?	C1d
2:00	**Cheese Shop**—there are many kinds of cheese	
19:00	**Cheese Making**—a Greek family does it the old-fashioned way	F3b
2:00	**How Old Is Old?**—music video/ comparative ages	F1
4:00	**Bloodhound Gang**—Case of the Thing in the Trunk (Part I)	

Friday (#725): The Parthenon

1:00	**Greece**—where in the world is it?	C1d
15:00	**The Parthenon**—modern engineers work to save a monument	B1a,F3b
2:00	**How Old Is Old?**—music video/ comparative ages	F1
4:00	**The Boat**—a floating reconstruction from ancient frescoes	F3
1:00	**Studying The Past**—many ways to learn about ancient times	
4:00	**Bloodhound Gang**—Case of the Thing in the Trunk (Part II)	

ISLAND WEEK

Monday (#726): Parrot Fish

1:00	**Huckleberry Island**—a small island near New York City	A2
1:00	**Island Song**—music video/what an island's all about	C1b
1:00	**Where In The World Is Bonaire?**	
10:00	**Parrot Fish**—studying the "cows of the sea"	A1,F
3:00	**Dive Equipment**—the gear for a safe time deep underwater	C4
2:00	**Air Compression Equipment**—how it works	B1a,B3b
:30	**Huckleberry Island**—what's an island made of?	C1b
1:00	**Island Making**—animation and film/how it happens	C1a
3:00	**Hike To Highest Point**—looking out over Bonaire, a Caribbean isle	C1
1:00	**How Do You Get To An Island?**—music video	C1b
2:00	**Island Geology**—history in stones	C1a

Tuesday (#727): Lizards

1:00	**How Do You Get To An Island?**—music video	C1b
1:00	**Where In The World Is Bonaire?**	
13:00	**Lizards**—a scientist studies their adaptation	A1,A3
2:00	**Scientist Song**—music video/an exciting profession	E
1:00	**Island Making**—animation and film/how it happens	C1a
3:00	**Island Bats**—the only mammals to reach Bonaire on their own, because they're the only mammals that fly	A1
4:00	**Night Dive**—visiting nocturnal creatures of the sea	C4
1:00	**Island Song**—music video/what an island's all about	C1b

Wednesday (#728): Coral

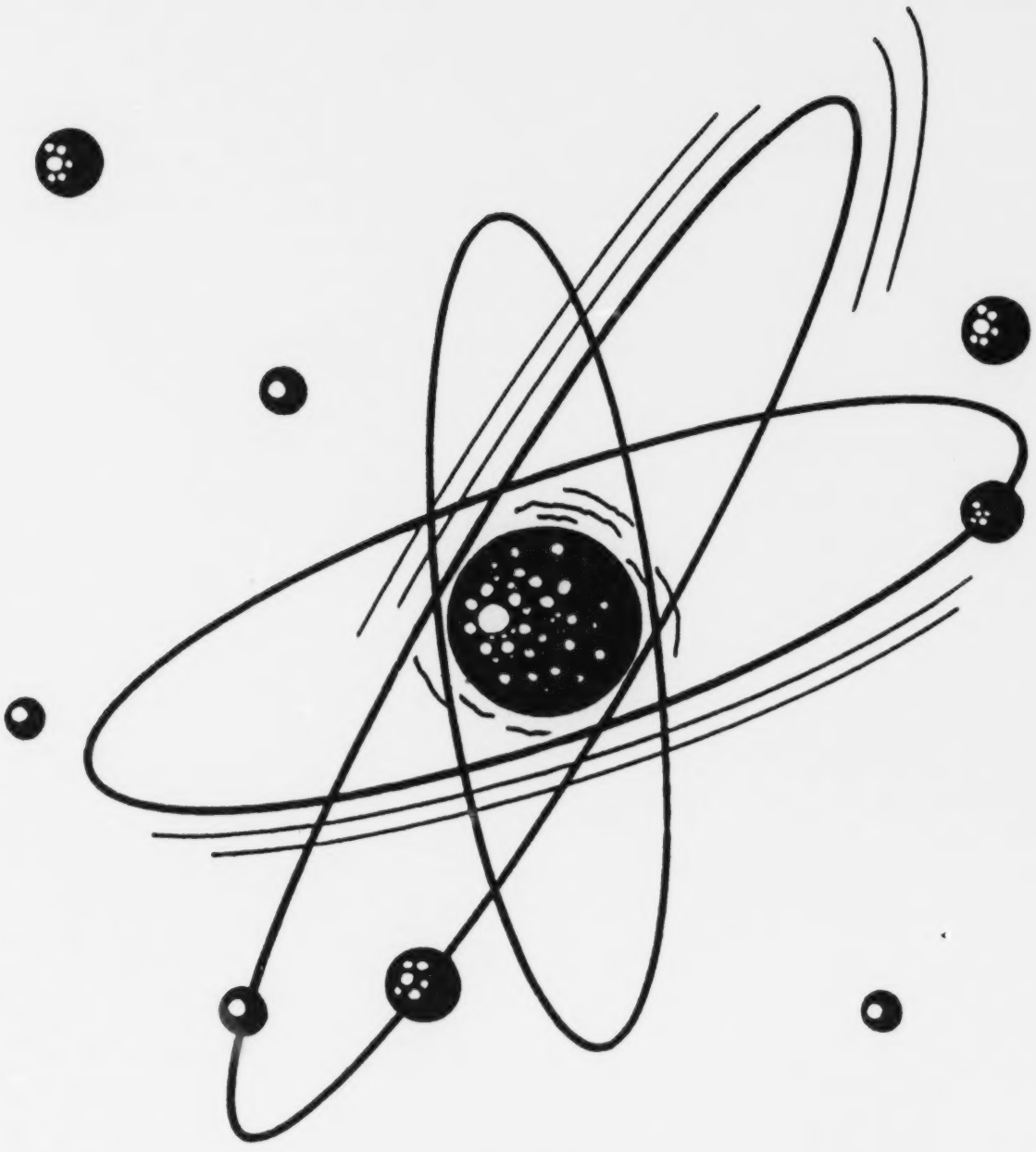
1:00	**Where In The World Is Bonaire?**	
1:00	**Island Making**—animation and film/how it happens	C1a
1:00	**Huckleberry Island**—the accretion of barnacles	A3
7:00	**Coral Babies**—how do these choosy creatures grow?	A1,A3
5:00	**Coral Reef Mapping**—an underwater task	F3a
1:00	**How Do You Get To An Island?**—music video	C1b
1:00	**Huckleberry Island**—archeological detectives	F3
7:00	**Island Archeology**—evidence of early human life	F3
2:00	**Island Kids**—and the many languages they speak	D1

Thursday (#729): Flamingos

1:00	**Where In The World Is Bonaire?**	
1:00	**How Do You Get To An Island?**—music video	C1b
2:00	**Huckleberry Island**—a great place for birds to nest	A1,A3
7:00	**Flamingos**—they breed on Bonaire; adults feed across the sea	A1
3:00	**Solar Salt Works**—mining the mineral from the sea	F3b
7:00	**Touching The Sea**—how to touch and feed sea creatures	C4
2:00	**Underwater Photography**—how to take pictures in the sea	C4,F2
4:00	**Night Dive**—visiting nocturnal creatures of the sea	C4

Friday (#730): Conch

1:00	**Where In The World Is Bonaire?**	
1:00	**Island Song**—music video/what an island's all about	C1b
1:00	**Huckleberry Island**—fishing is hunting	C4
15:00	**Conch Growing**—raising and "planting" baby conch	A1,A3
2:00	**Underwater Exploration**—searching with scuba gear	C4
1:00	**Island Making**—animation and film/how it happens	C1a
3:00	**Island Bats**—how they get to Bonaire, where they live	A1



CHILDREN'S TELEVISION WORKSHOP

3 • 2 • 1 CONTACT

TEACHER'S GUIDE

Fingerprint Record Card

NAME _____

DATE _____

CONTACT

	Little Finger	3rd	2nd	Index Finger	Thumb
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Trash Record Card

NAME _____

DATE _____

CONTACT

DATE	MON.	TUES.	WED.	THURS.	FRI.
TOTAL WEIGHT					

TYPE / UNIT					
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chalk/grams					

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ARCHITECTURE

SHOWS 611-615 • Architects shape space. They design buildings for people's particular purposes: eating, sleeping, work, and play. They put science to some of its toughest, most practical tests—meeting human needs. Architecture Week shows how.

Meeting Needs

Here's the architect's first question: "What do you need?" A traveling circus needs a big, portable arena (Monday). Masai herders in Kenya need homes that can be built quickly with easy-to-find materials (Tuesday). For a great cathedral, quick construction matters less than permanence and grandeur (Wednesday). Are the buildings shown in these segments the best solutions to the architectural problems? Students can come up with alternative ideas.

Collect photos of a number of buildings. Kids can try to guess a building's function from its design. Do schools have a distinct look? Factories? Office towers? Why?

On Friday's show, teenagers try to design a tall, strong tower using simple materials. Your students can take on a similar challenge. With two sheets of paper, seven paper clips, and a pair of scissors, they can try to build the tallest possible tower. With stronger materials, like popsicle sticks, glue, and tape, they can build a tower that's not only tall, but can hold up a heavy book.

Standing Tall

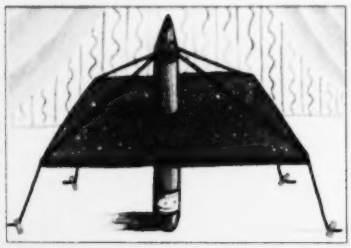
Architects use their understanding of physics to keep buildings standing. For instance, they arrange a circus tent's ropes so that tension holds the roof five stories above the ground (Monday). An experiment shows how tension holds things up:

1. Take a square of corrugated cardboard (about eight inches by eight inches), four feet of string, a sharp pencil, scissors, and a stapler.

2. Draw the diagonals of the square.

3. The place where the diagonals cross is the center. Make a hole at the center by pushing the pencil all the way through.

4. Figure out a way to use the string to make the pencil stand up straight in the hole. Although students may come up with other solutions, one of the best is to tie pieces of string to the pencil as guy wires.



ILLUSTRATIONS: DAVID R. SHELDON

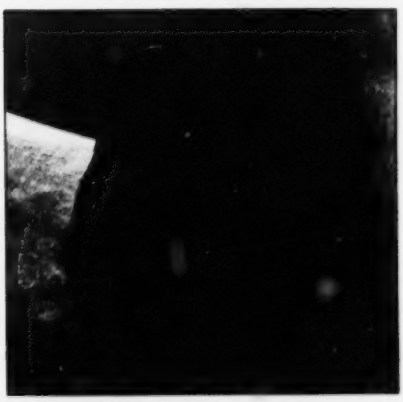
MAMMALS

SHOWS 616-620 • Mammals are rats and bats and tapirs and pandas and lots of other species—including humans. They're grouped together because they share basic characteristics. Mammals Week offers fun facts about mammals, along with biology concepts including competition for resources, adaptation, evolution, and natural selection.

Common Traits

All mammals share basic characteristics: hair or fur, live birth, lactation, and learning. Sea otters eat up to 30% of their body weight daily in order to generate heat. Their densely packed fur retains the heat (Tuesday). Female elephant seals spend two to three months on land, bearing and feeding their young (Wednesday). Baboons in the wild and chimpanzees at a zoo learn to find food by watching others, practicing, and playing (Thursday).

On Monday, cast member David Quinn learns how scientists classify animals—comparing traits like bone structure. Kids can practice classification by sorting a set of objects with multiple characteristics: a deck of playing cards, a bag of Valentine's



Day candies (different colors and messages), even a random set of library books.

PHOTOS: ANIMALS ANIMALS/TOP © M.J. COE, L. © JIM TUTEN, R. © LEONARD LEE RUE III

Dramatic Differences

Though mammals share characteristics, they differ widely. Every mammal may have hair or fur, but each has a distinctive type. Of nearly 1,000 varieties of bats, some navigate with vision, others with sonar-like echolocation; some are carnivorous, others eat only fruit; and only a few are dangerous to humans (Monday).

Many mammal differences developed as adaptations to environment. For instance, the horse, the rhino, and the tapir, three different mammals living in three different environments, all evolved from one ancestor (Friday). Wildebeests, in danger of lion attacks, have developed the ability to run within a few hours of birth. Bears developed their hibernating behavior to withstand frigid winters (Wednesday).

Examine differences and similarities among mammals. Choose two—one familiar (human, dog, cat, gerbil, etc.) and one unfamiliar. Research habitat, food, gestation period, number of offspring, etc. How are the common traits of mammals expressed in each species?

MODELING

SHOWS 621-625 • Models aren't just toys—they're tools. They're versions of reality that scientists can study. You can hold some in your hand. Others are big enough to walk through. Models may be symbols on paper or blips in computer memory. Some lead to major discoveries. Others are just plain fun.

Scientific Tools

Models represent reality. Some are built for testing. Engineers designing ships for the frozen waters of northern Canada make model ice—ice that's weaker than ocean ice—to test their model ships. Aerospace scientists use many models—drawings, computer models, and physical scale-models—to test new designs (Tuesday). Other models store information. Globe- and map-makers carefully choose colors and symbols to store information clearly and concisely.

On Wednesday's show, first graders map their neighborhood. Your students can make maps, too—e.g., of the classroom, the gym locker room, the inside of a desk. Each map should have a clear purpose, e.g., to orient new students to the school, to show where you can get a drink of water or plug in a TV.

Start by gathering information, measuring sizes and distances accurately. Decide on an appropriate scale—one that will fit on a page, with room for all necessary information. Don't forget a compass so users can orient themselves to use the map. (It doesn't have to say "North/South." It could say "To the cafeteria" or "To the mall.")

Models Involve Choices

Model-makers decide what details their models must include. Model race cars don't need to protect passengers' lives, so, unlike real cars, they're not made of steel (Monday). Miniatures built for museums don't need to work as well as the objects they're modeled on—just to look like them. On the other hand, a model knee, implanted in a human patient, needs to work just like a natural knee, though it may look quite different (Thursday).

Maps, again, provide convenient examples of model-making choices. Compare different maps of your town, e.g., street map, public transit map, election district map (available at town halls), topographic map (available at camping stores or from the U.S. Geological Survey). What details does each map include? Where do they overlap? Can you explain the map-maker's choices?

Modeling Spaces

A simulated rain forest, built to house animals in New York's Central Park Zoo, is a large-scale three-dimensional model. Friday's program shows how it was designed in two dimensions (on paper), then built in three.

Moving from 2-D to 3-D can be conceptually difficult. This activity can help students grasp the relationship between a flat map and a three-dimensional model:

1. Each student gets two copies of the reproducible page—a contour map. Each band on the map represents a different elevation.

2. Take one copy of the reproducible page. Carefully cut out and set aside each elevation band.

3. Roll a ball of clay into long, even strips.

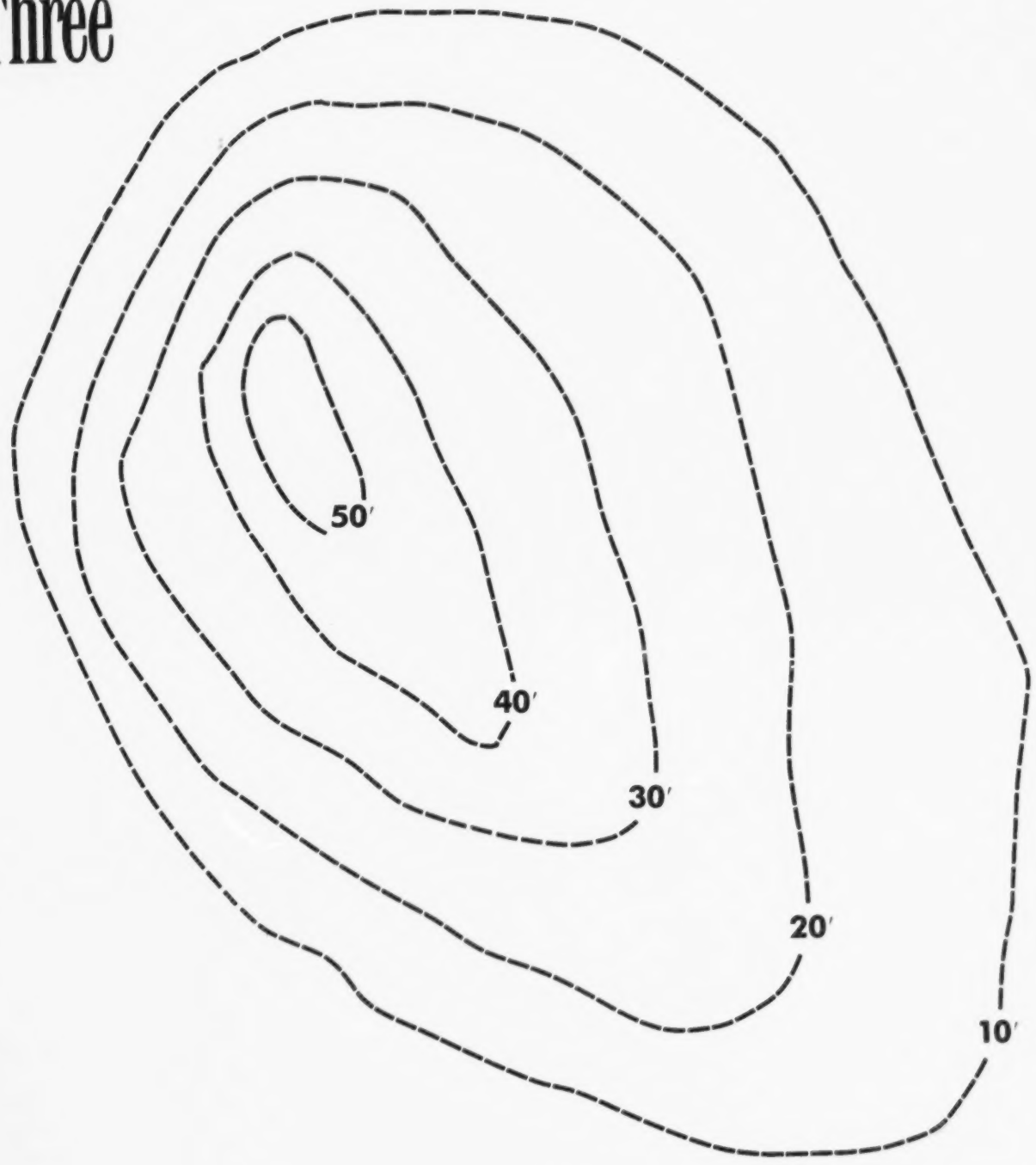
4. Put one strip of clay under each band. Add another strip for every 10 feet of elevation. (One strip goes beneath the 10-foot band, two strips beneath the 20-foot band, and so on up.) If you don't have enough clay, make clay legs—1/4 inch tall for every 10 feet of elevation.

5. Take the second copy of the reproducible page. Place each elevation band in its proper position on the map to build a 3-D model of the mapped area.

From Two Dimensions to Three

NAME _____

DATE _____



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At Home in the Air

Dragonflies have been airborne for 250 million years. Butterflies only take to the air when they're fully grown (Wednesday). Ladybugs fly, though they don't look as if they could (Thursday).

All airborne creatures need to navigate (Monday). How some do it remains a mystery: Pigeons find their way home from great distances and only some of the clues they use are known. Bats, the only flying mammals, use both vision and their special hearing to navigate.

Echolocation, the bats' sonar-like navigational ability, depends on their hearing sounds humans can't. Kids can test their own navigational hearing by playing "Marco Polo," a form of tag. One student, blindfolded, is "It." Standing in a large open area, she calls out "Marco." Her classmates respond "Polo." From the sounds of their voices alone, she has to track them down and tag one of them. They can keep moving, but they must respond each time "It" calls out.

Staying Aloft

In order to fly, people have had to learn a lot about the physics of the air (Thursday). Gliders depend on air currents. A softball's flight is controlled by gravity, the speed of the pitch, and the spin a pitcher puts on the ball. Helium blimps stay up because the gas they hold is less dense than atmospheric air. Hot air balloons work the same way (Tuesday).

Hot air is less dense because heat spreads air molecules over a greater space. To see this principle at work, place an empty soda bottle in a pail of ice water, then pull a prestretched balloon over its top. Pass the bottle around the class. As hands warm it up, the air will expand out of the bottle, filling the balloon. Place the bottle in a pail of hot water to extend the effect.

The Robot Pterodactyl

Dinosaur lovers will be intrigued by the combination of paleontology, aerodynamics, and computer science that enabled a California firm to construct and fly a half-scale robot pterodactyl (Friday). The robot's brain, like a real pterodactyl's, controls head movement to keep the machine on course. The brain does a complex job of information processing, as David Quinn finds out when he plays a "pterodactyl's brain" video game.

Kids can play a similar game. Chalk an obstacle course on the floor. One student, the "pterodactyl," tries to navigate the course, following the instructions of another student, the "pterodactyl's brain." The game introduces students to basic information processing skills—analyzing information, creating clear instructions, and making decisions "on the fly."

ANTARCTICA

SHOWS 701-705 • 3-2-1 CONTACT bundles up and heads south to unravel the mysteries of the coldest continent. Glaciers slide, penguins dance, and seals —well, they sleep—as your students explore Antarctica from the warmth of your very own classroom.

Getting There

After flying for 27 hours and halfway round the world, 3-2-1 CONTACT's crew finally reached Antarctica. At the last stop, in New Zealand, the crew was issued a special set of cold-weather gear, specially designed for the harsh climate they would soon encounter (Monday).

Cold-weather clothes are made of materials that insulate well. The following experiment displays some differences among materials' insulating properties: Take several paper cups. In each, make four vertical slits, creating flaps that fold down to cover the cup. Fill each cup with hot tap water. Take the water's temperature, using a sturdy household thermometer. Now wrap each cup with a different material—wool, polyester, cotton, blends, wet materials and dry ones, one layer and several layers. (Scarves and socks work well.) Check the water temperature every half-hour for two hours.

Compare the results. Cotton, for instance, insulates poorly when wet. Wool insulates wet or dry. Discuss the materials in your students' winter clothes. Why don't people wear heavy woolens in summer?

PHOTOS © CTW/LAWRENCE SINGER

Land Under the Ice

Antarctica is covered with ice, not made of ice. But the covering can be 9,000 feet thick. Beneath most of the ice is land—land that's actually exposed in certain "dry valleys" (Friday). Yet ice 300 feet thick covers even parts of the Ross Sea, at the continent's edge (Monday).

The physics of ice is fascinating. For instance, water, unlike most materials, expands when it freezes. To see this, place a couple of ice cubes in a cup. Fill the cup to the brim with water. The ice, since it's less dense, will float on top, above the rim of the cup. Let the ice melt. Do students expect the cup to overflow? It won't, since water takes up less space than the ice it melts from.

The Classic Paper Airplane

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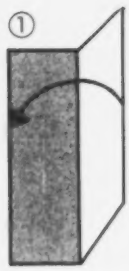
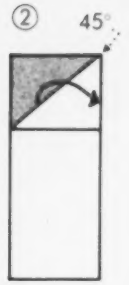
CONTACT





KEEP THE NOSE SHARP

TO MAKE FLAPS

TO MAKE VERTICAL STABILIZERS

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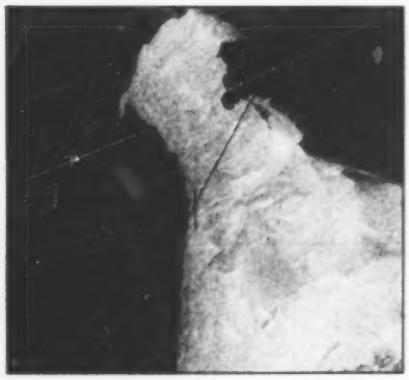

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PHOTOS: © CLYDE AMBROSE ENGEL

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NAME _____

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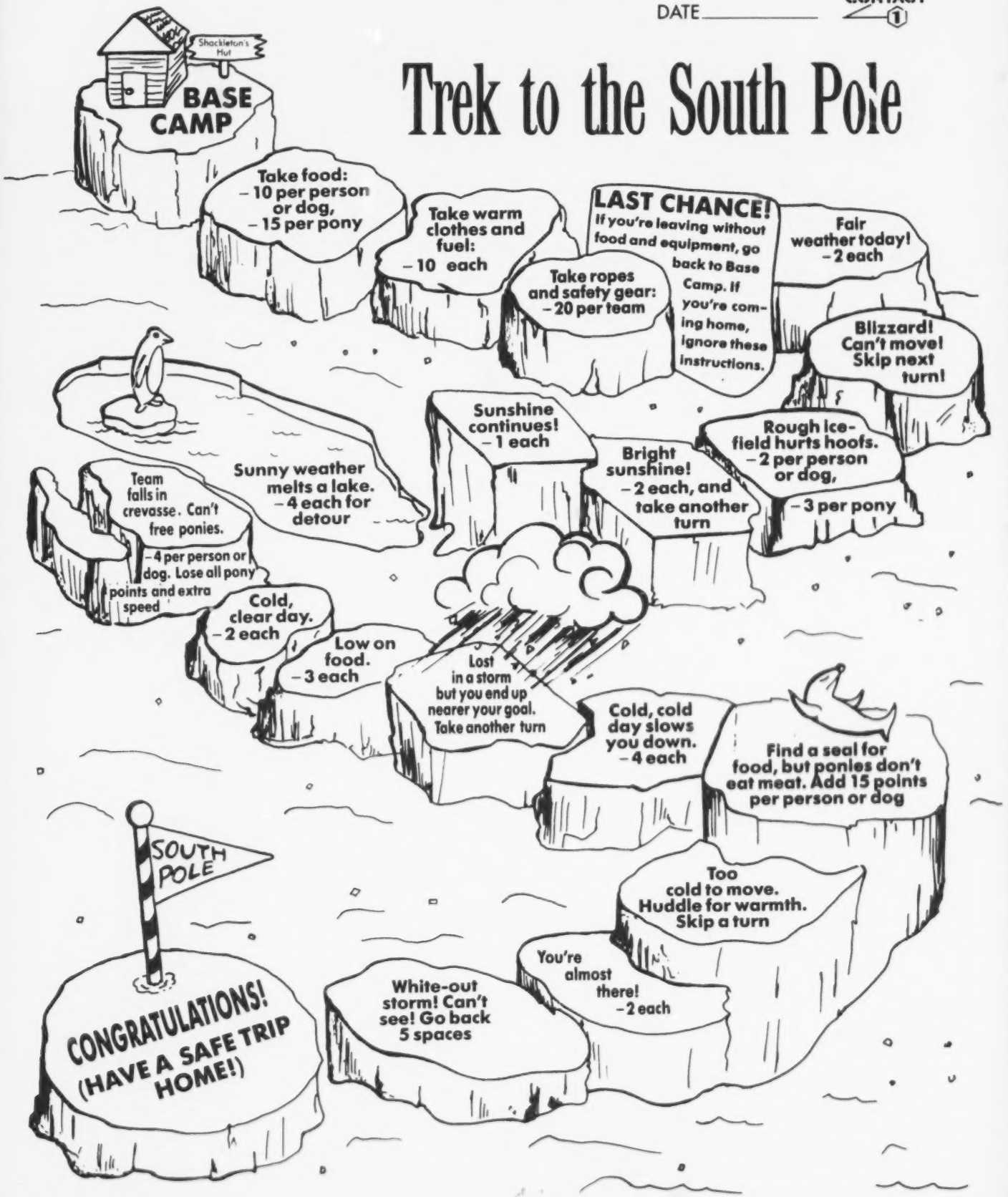
CONTACT

Trek to the South Pole


Shackleton's Hut
BASE CAMP
Take food: – 10 per person or dog, – 15 per pony
Take warm clothes and fuel: – 10 each
LAST CHANCE! If you're leaving without food and equipment, go back to Base Camp. If you're coming home, ignore these instructions.
Take ropes and safety gear: – 20 per team
Fair weather today! – 2 each
Blizzard! Can't move! Skip next turn!
Sunshine continues! – 1 each
Rough ice-field hurts hoofs. – 2 per person or dog, – 3 per pony
Bright sunshine! – 2 each, and take another turn
Sunny weather melts a lake. – 4 each for detour
Team falls in crevasse. Can't free ponies. – 4 per person or dog. Lose all pony points and extra speed
Cold, clear day. – 2 each
Low on food. – 3 each
Lost in a storm but you end up nearer your goal. Take another turn
Cold, cold day slows you down. – 4 each
Find a seal for food, but ponies don't eat meat. Add 15 points per person or dog
SOUTH POLE
Too cold to move. Huddle for warmth. Skip a turn
You're almost there! – 2 each
White-out storm! Can't see! Go back 5 spaces
CONGRATULATIONS! (HAVE A SAFE TRIP HOME!)

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You and You Alone!

NAME _____

DATE _____

CONTACT

Every *body's* different. Circle the words that describe yours, then graph your "body-line." For instance, the grey body-line on the graph stands for a boy (B), who has red (D), wavy (B) hair, grey eyes (E), and unattached earlobes (B). He can't roll his tongue (B), and his index finger is longer than his forefinger (A).

GENDER

A. GIRL
B. BOY

HAIR COLOR

A. BROWN
B. BLACK
C. BLOND
D. RED
E. GREY/ WHITE
F. OTHER

HAIR QUALITY

A. STRAIGHT
B. WAVY
C. LOOSE CURLS
D. TIGHT CURLS
E. OTHER

EYE COLOR

A. BLUE
B. BROWN
C. GREEN
D. HAZEL
E. GREY
F. OTHER

EAR LOBES

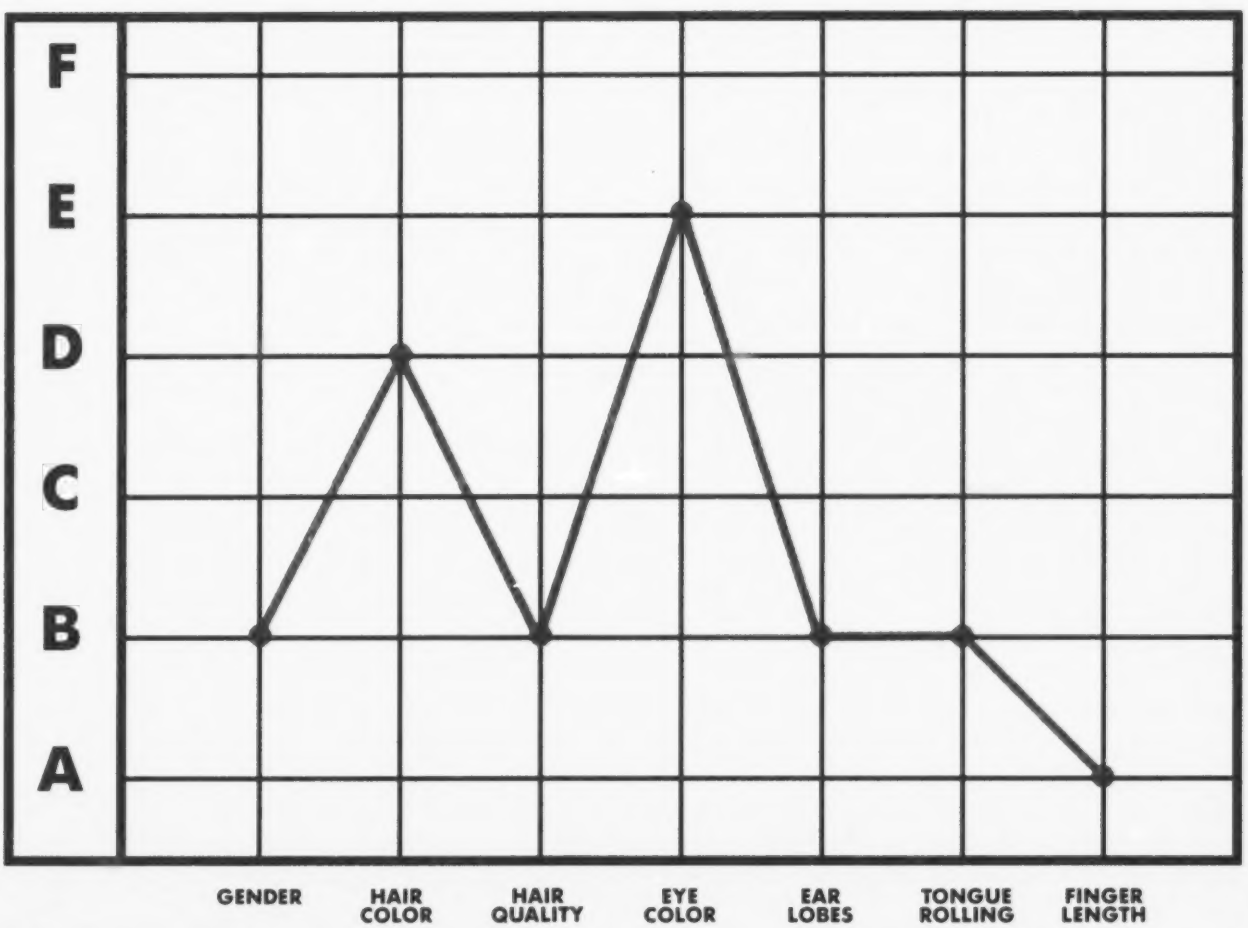
A. ATTACHED
B. UNATTACHED

TONGUE ROLLING

A. YES
B. NO

FINGER LENGTH

A. INDEX FINGER LONGER THAN FOREFINGER
B. FOREFINGER LONGER THAN INDEX FINGER



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Australia

GONDWANALAND

SHOWS 711-715 • Australia may look like a big island, but it's actually the world's smallest continent. It's an isolated place, and home to many remarkable animals—from more than 50 species of kangaroos to the world's only egg-laying mammals. 3-2-1 CONTACT hunts out the marvelous creatures that inhabit the land down under.

Unique Species

Kangaroos (Friday) aren't the only species unique to Australia. In an afternoon of bird watching, David Quinn discovers the magnificent king parrot; the bowerbird, who decorates his play area with bits of blue; and the emu, a bird that can't fly, but can run 35 miles an hour (Wednesday).

David joins scientists tracking the echidna, or spiny anteater (Monday),

© CTW

the elusive, nocturnal platypus (Monday), and the not-so-cuddly koala (Thursday). He helps Australian scientists tag these unusual animals so they can study their lives in the wild. Scientists stake out observation posts and wait for tagged animals to come by. This method enables them to answer questions about the animals' lives—for instance, how often do animals return to the same habitats?

To see how tagging works, "tag" your students with armbands of brightly colored cloth. Tag other classes with other colors. At recess and in the lunchroom, students can take up observation posts and study the traffic patterns, play choices, and eating habits of tagged individuals dispersed in a larger population.

Insects for Human Survival

Aborigines, the original inhabitants of Australia, took advantage of a protein source that now seems strange: They ate moths. On Tuesday, David, Michelle, and an Australian archeologist catch, roast, and eat Bogong moths.

Another insect species, the dung beetle, helps humans today. Australia's 30 million cattle drop some 360 million cowpads on the country's pastures every day. To keep pastures from being covered with leftovers, some 30 species of dung-eating beetles have been introduced. Beetles can eat 95 percent of a cowpad in a week, alleviating the problem (Tuesday).

Students can see a similar phenomenon in the classroom—the work of molds, or microscopic fungi, in decomposing bread. Moisten a piece of preservative-free bread, such as rye or whole-grain bread from a bakery. After a day or two in the open, place the bread in a dark, damp place. Be sure to cover it and tape it closed—some students may be allergic to the growing molds. Observe over several days as the molds grow, eating away at the bread. If students try this experiment without moistening the bread, they'll see that molds require not just food, but moisture, to live and grow.

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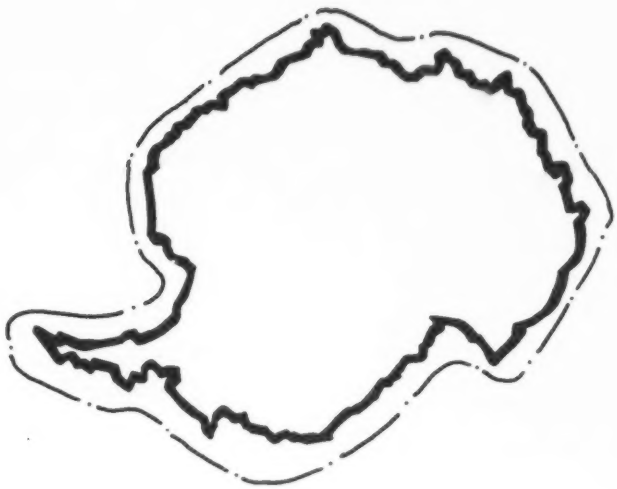

Gondwanaland

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STRUCTURES

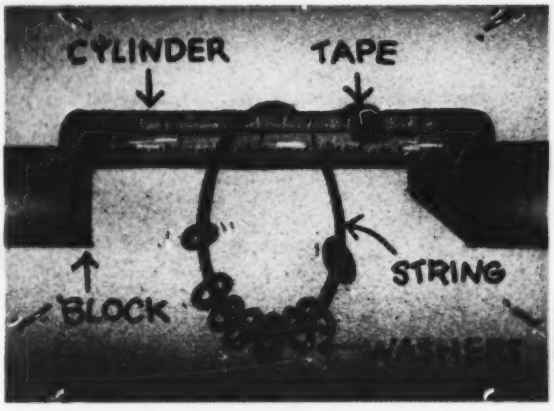
SHOWS 716-720 • Strength. Flexibility. Stability. Grace. What gives an object these qualities? More often than not, it's structure—the way nature, or people, put the object together. 3-2-1 CONTACT looks at the physics and the functions of structures in nature and technology.

Natural Elegance

Some of the world's most elegant structures appear in nature. That's because they make physical sense. In crystals, for example, atoms are arranged in a regular, organized pattern (Wednesday). In some cases, such as snow, each crystal is unique, although each has the same number of sides. In others, such as sugar, all crystals have the same shape.

Sugar crystals are a vivid, easily made example of crystalline structure. Tie a knot in one end of a clean string. Tie the other end to a pencil. Rest the pencil across the top of a hard plastic cup. The string should hang down, but not touch the bottom.

Stir 2½ cups of sugar into 1 cup of water and cook over medium heat, without stirring, until 3-4 minutes after the solution boils. Allow to cool 2 minutes, then pour into students' prepared cups. Allow the cups to sit undisturbed for at least a week, covered with plastic wrap. Make daily observations as crystals ("rock candy") form on the string. At the end, kids can eat the candy.



Functional Design

People create structures for specific functions. Often, they use structural principles found in nature. For thousands of years, people in Britain have roofed buildings with thatch, taking advantage of the strength, resilience, and insulating qualities of reeds—nature's hollow cylinders. Today, bicycle manufacturers use the physics of the cylinder in creating strong, light, rigid tube frames for bikes (Tuesday).

How strong is a cylinder? First, lay a piece of paper like a bridge across two blocks or books. One by one, place washers on the paper until the "bridge" collapses. Now roll the paper into a cylinder an inch in diameter, sealing it with tape. Place the cylinder across the blocks. Tie washers to a string, and hang the string on the cylinder. How many more washers can the same paper support as a cylinder than it could when it was flat?

bubble festival

On Monday, Hopey and Todd visit a "bubble festival" at Philadelphia's Franklin Institute. Bubbles form and interact according to specific principles of physics. For instance, they tend to enclose a given volume of air with the least possible surface area. They're also fun.

To study bubbles, pour a little bubble solution on a tabletop. (There's a recipe in the box to the left.) Use a straw to blow flat-bottomed bubbles on the table.

- **Blow, then pop bubbles. When the bubble bursts, measure the diameter of the ring it leaves. How big was the bubble? Is there a maximum size? A minimum? Why? Would these change if you used more water in the bubble solution? More detergent?**
- **Make two bubbles of different sizes which touch. (The smaller one always bulges into the larger one. Why?)**
- **Make several bubbles of similar size which touch. (If three, they'll probably just touch. If four, one will probably break, because four walls are less stable than three.)**

GREECE

SHOWS 721-725 • Greece—a land where up-to-the-minute science uncovers clues to the ancient past. Join an archeological dig on an island reshaped by a volcano. Visit a family of cheese-makers whose methods blend past and present. Watch engineers use modern technologies to restore the wonders of the past. It all happens in 3-2-1 CONTACT's Aegean adventure!

PHOTO: T.H. POUGH / COURTESY DEPARTMENT LIBRARY SERVICES - AMERICAN MUSEUM OF NATURAL HISTORY - 411762

The Earth Is Alive

The rocks of Santorini, an island in the Aegean Sea, bear witness to a history of volcanic eruptions. Ancient cities lie buried beneath the island's layer of volcanic ash (Tuesday, Wednesday). Iron-rich mud at the edge of a volcanic lake, or "caldera," and sulfurous gases rising from mountain vents provide evidence that Santorini's volcano is dormant, not extinct (Monday).

Kids can build a model volcano. The model erupts because of a chemical reaction, not because of pressure building deep within the Earth, but it does show how volcanoes bubble up, pouring material forth and leaving a new layer of material on the surface.

Build a basic volcano shape with clay, styrofoam, or papier maché, placing a paper cup inside the top. Mix baking soda and water in the cup. In a second cup, mix vinegar and liquid dish detergent. Pour the second mixture into the volcano. The vinegar and baking soda react to produce carbon dioxide gas. The gas forms bubbles in the detergent, which then flows up and out and over the side of the volcano. Experiment with different proportions of the ingredients.

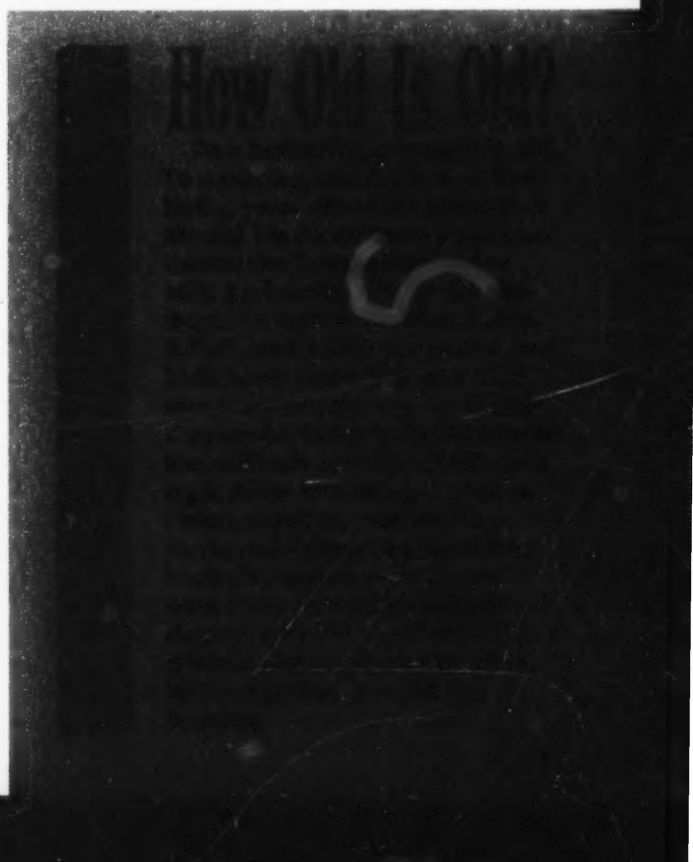
Pieces of the Past

When Santorini's volcano erupted, a blanket of ash covered the city of Akrotiri. Archeologists show cast member Hopey Fitzpatrick the once-buried streets and shops of Akrotiri (Tuesday) and teach her how bits and pieces of pottery can be cleaned, pieced together, and studied as evidence of ancient ways of life (Wednesday).

To give your class a sense of this work, present a set of pieces broken from common objects—e.g., pencils, tea cups, combs, buckles. Students try to identify the original objects. (With advanced students, use more complex objects, such as one piece from each of several jigsaw puzzles. Students are shown pictures of the puzzle and must match each piece with its puzzle.)

The most famous remnant of ancient Grecian architecture is the Parthenon in Athens. Hopey learns how engineers are restoring the Parthenon, ravaged by air pollution and by the mistakes made in prior reconstructions (Friday).

In a classroom version of archeological reconstruction, use 10 blocks to build a structure. Don't let students see it. Sketch it, then knock it down. Have students observe the ruins and take notes. Repeat at least three times. Then distribute copies of your sketches. Can students match the sketches with the ruins they saw? (With several sets of blocks, groups of students can build and sketch, then test each other's archeological insights.)

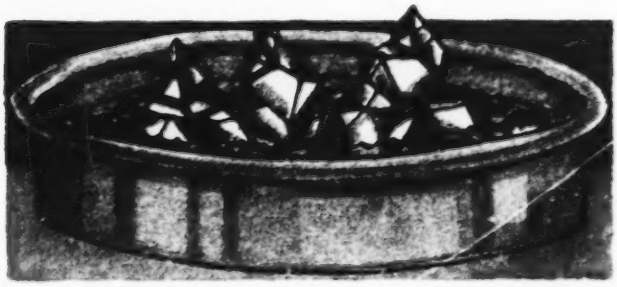


ISLAND

SHOWS 726-730 • A desert island isn't always a deserted island. 3-2-1 CONTACT visits an island brimming with life—lizards and flamingos on land, conch and coral in the ocean, and bats in the air. Welcome to a week of sun, sea, and scientific discovery on the Caribbean isle of Bonaire.

Living in Isolation

An island is an isolated place. Living things must swim, float, or fly there if the island is to have any life at all (Tuesday). Even so, an island may not have enough resources to support its inhabitants. Flamingos breed on Bonaire, but there's only enough food there for the young. Adults must feed in Venezuela. Each evening, they fly across the sea and back, leaving one or two behind to babysit (Thursday).



ILLUSTRATIONS: KEVIN SCHAFER

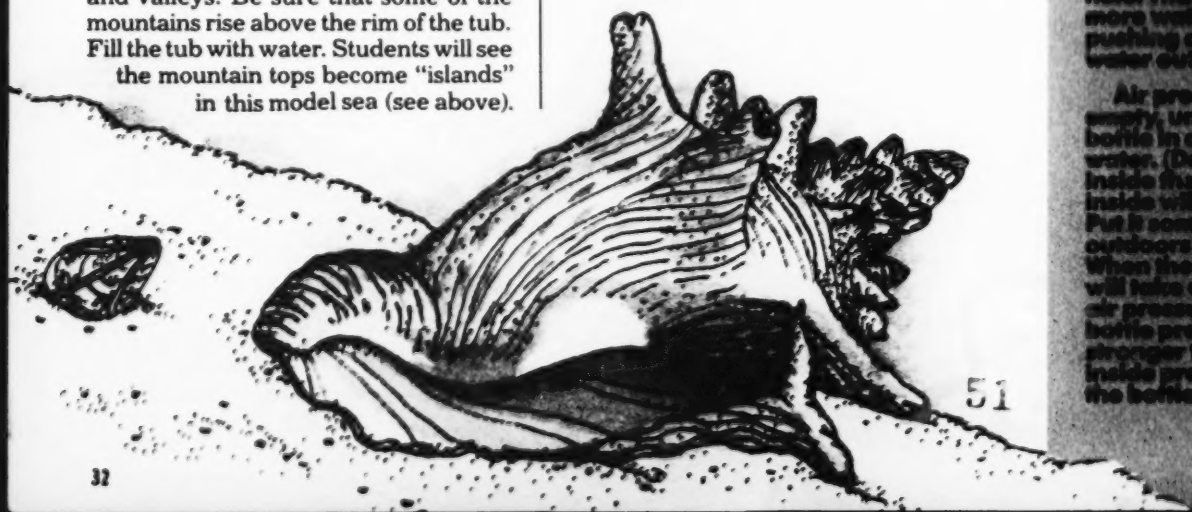
The isolated nature of an island is easier for students to grasp when they understand that most islands are the tops of oceanic mountains: Use aluminum foil to line a small tub or pan with an "ocean floor," complete with mountains and valleys. Be sure that some of the mountains rise above the rim of the tub. Fill the tub with water. Students will see the mountain tops become "islands" in this model sea (see above).

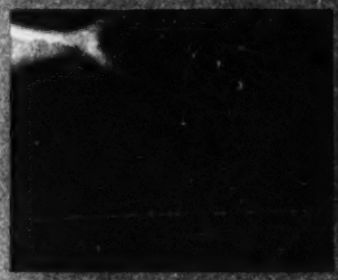
Limited Resources

Humans living on a desert island learn to make the most of limited resources. Bonaire's land is too dry and rocky to farm, so for years people have eaten conch, a large snail that they harvest from the sea. The conch supply is dwindling. Todd and Debra meet a scientist who's working to restock the sea with lab-nurtured conch (Friday).

One plentiful ocean resource is salt—and one of Bonaire's few industries is mining salt from the sea. In an ancient process, the salt miners pump sea water into shallow pools and wait for the sun to evaporate the water, leaving salt behind. In three months, salt goes from a sea solute to a salable crystal (Thursday).

Kids can experiment with this process in the classroom. Dissolve salt in water. Pour a thin layer of the liquid into a flat dish. Then, like the miners of Bonaire, wait. When the water evaporates, students will discover the crystals left behind.





SCUBA GEAR

Much of Island Week takes place underwater. As Debra and Todd explain, 3-2-1 CONTACT's cast and crew had to learn to dive (Monday, Wednesday, Friday). They had to learn to maneuver in the high water pressure of ...ean depths. They had to master equipment that brings breathable air below the surface and regulates air pressure for comfortable breathing. Here are two simple activities that demonstrate the effects of water and air pressure.

Water pressure: Poke three pinholes, a few inches apart, up the side of a large plastic bottle. Cover each with tape, then fill the bottle with water. Remove the tape from the top hole. Observe the flow of water out the hole. Then replace the tape, refill the bottle, and repeat with each of the other two holes. Now try uncovering all three holes at once. Notice how much more powerfully the water rushes from the bottom hole. That's because there's more water pressure pushing down, forcing water out the hole.

Air pressure: Place an empty, uncapped plastic bottle in a bucket of hot water. (Don't let water inside the bottle.) The air inside will expand. Cap it. Put it somewhere cool—outdoors or in a freezer. When the air inside cools, it will take up less space. The air pressure outside the bottle pressing in will be stronger than the pressure inside pressing out—and the bottle will cave in.

3-2-1 CONTACT is also a science magazine for children 8-14. It is published 10 times a year by Children's Television Workshop, and it reinforces the scientific concepts, processes, and principles of the TV program. To subscribe, use the postage-paid order card bound into this Guide. School bulk subscription rates are also available. For a sample copy, send a check for $2.00 to:

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Children's Television Workshop
One Lincoln Plaza
New York, NY 10023

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